

Understanding the Economics of Land Access in Ireland

A thesis submitted in fulfilment of the degree of
Doctor of Philosophy

by
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DESCRIPTION OF THESIS

This thesis analyses land availability and mobility in Ireland. The thesis begins with an overview of the economic theory of agricultural land markets followed by a description of Ireland's current land use structures and barriers to land use change.

A farm microsimulation model is then developed which allows one to consider the effect of taxation policy at a farm level. The microsimulation model is used to compare financial returns from a range of agricultural land uses in order to examine the effect of policy instruments on land mobility. The analysis finds that in numerous scenarios, leasing out agricultural land on a long-term basis can prove more profitable than farming the land.

Attitudes amongst Irish farmers toward land mobility and openness to various forms of land transaction are also examined. The analysis is based on a nationally representative survey of 846 Irish farmers. The results show that farmer attitudes significantly affect openness to land mobility. Factors such as age, income from farming and the presence of a successor also influence farmers' willingness to enter the land market.

Finally, a discrete choice experiment (DCE) is used to estimate farmers' preferences for land attributes in rental markets. The land attributes used in the DCE are rental contract, distance of land from farmyard, soil quality, and rental price. When renting in land, leasing is preferred to conacre. Farmers only want to rent land with good soil. Adjacent land and land 5km away is preferred to land 1km away. The higher the rental price, the less preferred the land is. When renting out land, leasing is preferred to conacre. Farmers would prefer to rent out land the further away from the farmyard it is. Farmers would prefer to rent out land with worse soil and would prefer to rent out land at a higher price. The thesis concludes with some recommendations for future research in the area.

STATEMENT

I declare that the research presented in this thesis is my own work.

Signed

.....

Cathal Geoghegan

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ABBREVIATIONS

Abbreviation	Explanation
ASC	Alternative-specific constant
BPS	Basic Payment Scheme
CAP	Common Agricultural Policy
CAT	Capital Acquisition Tax
CGT	Capital Gains Tax
CL	Conditional logit
CSO	Central Statistics Office
DAFF	Department of Agriculture, Fisheries and Forestry
DAFM	Department of Agriculture, Food and the Marine
DAS	Disadvantaged Areas Scheme
DCE	Discrete choice experiment
EU	European Union
FH2020	Food Harvest 2020
FW2025	Food Wise 2025
GHG	Greenhouse gas
GM	Genetically modified
IFCN	International Farm Comparison Network
IIA	Independence of irrelevant alternatives
LFA	Less Favoured Area
LU	Livestock unit
MNL	Multinomial logit
NFS	National Farm Survey
NPV	Net present value
OECD	Organisation for Economic Co-operation and Development
PCA	Principal component factor analysis
PRSI	Pay Related Social Insurance
RPL	Random parameter logit
SCSI	Society of Chartered Surveyors Ireland
SFP	Single Farm Payment
SPS	Single Payment Scheme
SQ	Status quo
UAA	Utilised agricultural area
USC	Universal Social Charge
WTA	Willingness to accept
WTP	Willingness to pay

Chapter 1. INTRODUCTION

Agricultural land holds a unique place in Irish society. Historically, this can be attributed to two main factors: lack of industrialisation and political ideology (Dooley, 2004). The industrial revolution of the nineteenth century failed to make any positive impact on Ireland outside of the north east region that would later become Northern Ireland. The rest of the country remained predominantly unindustrialised and rural with the vast majority of people dependent in varying degrees upon the land for a livelihood or quite simply for survival. The nineteenth century also saw the consolidation of the ideology that promoted land as the basis of the nation, with land ownership becoming indelibly related to the issues of identity and independence through movements such as the Irish National Land League.

Today, land remains an important component of agricultural life in Ireland. The major farming systems (cattle, dairy and sheep farming) rely on outdoor, grass-fed production systems while tillage farming requires good quality land for the production of crops. Therefore, land continues to be an essential input for Irish farmers. In addition, there remains a cultural attachment to land, with a desire amongst farmers to keep land within ‘the family name’ (Donnelan et al., 2008).

This thesis describes the use of land by Irish farmers and how this usage may change in the face of changing national and international policy conditions. Specifically, this thesis focuses on land mobility and how Irish farmers interact with land markets. This chapter provides an introduction to this work. Section 1.1 provides the motivation for the thesis, looking at the policy context in which this research takes place. Section 1.2 contains a review of the literature, focusing on the role of land markets and land mobility in Ireland. Section 1.3 provides the objectives of this research while Section 1.4 details how this thesis contributes to the international literature and the policy debate in Ireland. Finally, Section 1.5 provides a brief overview of each chapter of the thesis.

1.1 MOTIVATION

Irish farmers are currently experiencing a time of great change in the agricultural policy landscape. The quota on the amount of milk that can be produced by farmers within the European Union (EU) was removed in April 2015, allowing farmers to produce

unlimited amounts of milk for the first time since 1984. The first substantial reform to the Common Agricultural Policy (CAP) since 2008 took effect in 2016, instituting a new Basic Payment System (BPS) which puts increased emphasis on environmentally friendly farming practices. Ireland's commitments to fighting climate change may also affect agricultural practices through land use change or alterations in the mix of agricultural activities undertaken on Irish farms.

Irish government policy regarding the agri-food sector is set out in the Food Harvest 2020 (FH2020) and Food Wise 2025 (FW2025) policy documents. Both documents outline the Irish government's ambition to grow primary agricultural production, value-added production and agricultural exports in the upcoming years. One of the primary policy targets entails growing primary dairy production following the removal of the quota system. FH2020 puts forward a target of 50% growth in milk production by the year 2020 using the years 2007 to 2009 as a baseline while FW2025 commits to ongoing and sustainable expansion in dairy production up to the year 2025 and beyond.

Dairy farming in Ireland relies upon a pastoral, grass-fed production system (Dillon et al., 2008). Therefore, land is a primary input for dairy farmers. The dairy expansion envisaged in FH2020 and FW2025 will therefore require additional land onto which existing dairy farmers can expand and new dairy farmers can establish themselves. Achieving such a reallocation of land will require well-functioning land markets.

However, agricultural land markets in Ireland are notable for their lack of fluidity. The main avenue by which land changes hands is through inheritance with farmers generally exhibiting a desire to keep land 'in the family name' (Bogue, 2013; Donnelan et al., 2008). As a result, far less than 1% of agricultural land comes on the market for purchase each year. Land rental markets are small by European standards with only 18% of agricultural land being rented each year (Ciaian et al., 2010). The rental market is also characterised by the preponderance of short-term or 'conacre' renting where rental contracts typically last for 11 months at a time.

In the context of Ireland's lack of farmland mobility and the importance of land markets to facilitate structural change to meet policy targets, this thesis attempts to understand farmer preferences in relation to land mobility through the use of economic choice theory. Preferences related to both land supply and land demand are investigated so as

to understand how both sides of the land market function. From a policy point of view, this research can provide insight into the factors that influence farmers' land mobility decisions. Furthermore, such insights could better inform policymakers in terms of designing incentives to encourage agricultural land mobility.

1.2 LITERATURE REVIEW

Access to land is a basic requirement for most agricultural systems. As an important factor of production, farmers require avenues through which they can access land. Land sales and land rental markets provide such an avenue. The developmental economics literature has provided insight into the conditions that allow such land markets to emerge (Deininger & Feder, 2001; Deininger, 2003). Central to this process is the movement from communal to individualised property rights arising from a combination of increasing population density, technical progress, commercial integration and the reduction of risk. This combination of factors sets in motion a virtuous cycle of technical change and investment that precipitates increasing precision in the definition of property rights (Deininger & Feder, 2001).

From an economic point of view, land markets should allocate land to its most productive use if markets are functioning properly. In the agricultural context, land markets should allow the transfer of land from less efficient to more efficient farmers, thereby leading to the optimal land allocation amongst farmers (Le Mouél, 2004). However, empirical studies of how agricultural land markets function have found that farmland markets are subject to many imperfections that limit market efficiency (Ciaian et al., 2012a; OECD, 2008). A primary area of focus for much of the land market imperfection literature is the effect of agricultural subsidies on farmland purchase and rental prices (Barnard et al., 1997; Breustadt & Habermann, 2011). Agricultural subsidies can influence land markets when support payments become capitalised into land values, making land more expensive to purchase and to rent (Feichtinger & Salhofer, 2013).

In addition to suffering from market imperfections, farmland markets can also differ quite significantly from country to country. In the EU, farmland rental rates vary significantly from 17% in Romania to 89% in Slovakia (Ciaian et al., 2010). The structure and operation of farmland markets often arise out of historical and institutional

forces (Swinnen, 2002; Swinnen et al., 2016). Legislative and regulatory efforts can have perverse effects on land markets, encouraging either land ownership or land rental to dominate in specific countries. This can be seen in Western Europe where attempts to reform landlord-tenant relations in the early 20th century took one of two forms: the introduction of regulations to improve the position of tenants or public assistance for tenants to gain ownership of land. Countries that pursued the first option have tended to have land structures dominated by renting while nations who pursued the second option have continued to favour land ownership (Swinnen, 2002).

In Ireland, the option of allowing tenant farmers to purchase their holding using state provided loans was pursued. As a result, the agricultural structure of the country was transformed from one where 96% of agricultural land was rented in 1870 to one where only 6% of total farmland was rented by 1930 (Swinnen, 2002). This preference for land ownership amongst Irish farmers has continued into modern times with owner-occupancy being the dominant form of farm structure today (Donnelan et al., 2008). As a result, Ireland has long experienced a lack of land mobility with the revealed preference for land ownership frequently being cited as an impediment to structural change in Irish agriculture (Commins, 2001; Inter-Departmental Committee on Land Structure Reform, 1978; Maguire, 1983).

Studies examining land mobility in Ireland have tended to focus on intra-family land transfer through succession and inheritance (Gilmour, 1999; Hennessy & Rehman, 2007; Kennedy, 1991). Research on land mobility outside of the family environment have been relatively rare in Ireland although Conway (1986) and Jenkins (1997) provide insight into land leasing markets in the west and south-east of Ireland respectively. Support has been found amongst Irish farmers for initiatives encouraging land mobility but farmers have also been shown to be reticent about taking advantage of such initiatives themselves (Banovic et al., 2015; Bogue, 2013)

1.3 OBJECTIVES OF THE THESIS

This main objective of this thesis is to attempt to investigate issues surrounding agricultural land mobility in Ireland. In order to achieve this task, a number of sub-objectives were identified. These are outlined below:

1. To identify the structure of agricultural land holdings in Ireland according to the agronomic characteristics of the land and the farm system.
2. To establish the trends associated with Irish farmland markets in recent years.
3. To determine the capacity of Irish agriculture to meet milk expansion policy targets given current land structures.
4. To ascertain the likelihood of land restructuring occurring as a result of current farmers switching farm system.
5. To compare financial returns from long-term leasing out land with returns from farming so as to determine whether long-term leasing or farming is a more profitable use of the land.
6. To investigate the role of tax and subsidy policy on the profitability of long-term leasing and farming.
7. To examine the role of farmer attitudes on willingness to enter the land market.
8. To identify the characteristics of farmers who are willing to enter the land market and the characteristics of farmers not willing to enter the land market.
9. To explore differences between farmers willing to transact land permanently through buying and selling and farmers willing to transact land temporarily through land rental.
10. To determine the features of agricultural land that are important to farmers when transacting land.
11. To provide a ranking of farmers' preferences regarding farmland attributes.
12. To elicit farmers' willingness to pay (WTP) and willingness to accept (WTA) for farmland attributes.

1.4 CONTRIBUTION

In achieving the research objectives outlined above, this thesis adds to the existing literature in a number of ways.

First, a novel methodology (the discrete choice experiment) is used to estimate farmers' preferences regarding farmland attributes. To the author's knowledge, this is the first time this methodology has been used to estimate farmers' farmland preferences in a developed country and the first time both land supply and demand preferences have been estimated simultaneously.

Second, this research provides insight into the characteristics of farmers who are willing to supply and demand land. This may prove useful to policy makers in terms of accurately targeting policy instruments so as to encourage the land restructuring that may be necessary to meet policy targets.

Third, this thesis adds to the existing literature on farmland markets by identifying the factors that influence a farmer's decision to supply or demand land. Results contained in Chapter 5 indicate the importance of attitudinal factors in this decision, in addition to socio-economic and farm related influences.

Fourth, Chapter 3 provides a case study examining the effects of institutional factors on land markets. Given that the chapter looks at the effects of subsidy and tax policy, two variables that influence land decisions in virtually all developed countries, the research findings are applicable in an international context.

1.5 STRUCTURE OF THESIS

This thesis is laid out as follows.

Chapter 2

The chapter explores the economic theory of agricultural land markets. The role of land rent in the theories of Classical economists such as Adam Smith, David Ricardo and Johann Heinrich von Thünen is outlined, followed by an explanation of how these theories inform current models of agricultural land markets. Empirical research has found that farmland markets rarely operate as efficiently as economic theory would suggest (Ciaian et al., 2012a; Le Mouël, 2004). The chapter describes a number of land market imperfections that are found in the literature and suggests how these imperfections affect the functioning of land markets.

Chapter 3

This chapter utilises the Teagasc National Farm Survey (NFS) to describe Ireland's current land use structure and barriers for land use change. It describes the socio-economic characteristics of farms in terms of their land use so as to inform our understanding of what changes may be required to facilitate land use change to meet the current and future needs of Irish agriculture. From the perspective of meeting FH2020 and future strategic targets, the chapter looks at the potential capacity for meeting these targets given current structures and the scope for land use change. This is followed by an examination of potential socio-economic barriers to change and restructuring.

According to the NFS, cattle farming is the dominant system of agriculture in Ireland, accounting for 57% of agricultural land in 2011. The share of rented farmland sits at 18% of all agricultural land, far below the European average. Nominal rent prices have remained stable over time, regardless of the quality of the land. Agricultural land values underwent a boom due to a rise in residential and commercial property prices from the late 1990's until the economic crash of 2008 caused a sharp drop in prices. A very small amount of farmland is bought and sold each year, a pattern that predates the rise in agricultural land values during the economic boom.

Given the current land structures, it can be concluded that dairy farmers will require more land than is currently available to meet FH2020 targets. This extra land may come from non-dairy farmers. Cattle farmers are seen as most likely to transfer to dairy farming in the future but structural and demographic issues may mean that a smaller amount of switching between cattle and dairy systems will occur than is expected by policy makers. This may impinge upon future growth in the Irish agri-food industry. In order to achieve policy objectives, better incentives may have to be developed to encourage the mobility of land between farmers.

Chapter 4

Chapter 4 details the development of a farm microsimulation model. The model allows us to abstract from population, behavioural and policy complexity in order to consider the effect of taxation policy at a farm level. The behavioural drivers for different farm level decisions are considered including land access and release, animal stocking rate decisions, intergenerational decisions such as succession and inheritance, and farm

investment decisions. The model uses stylised farm households to consider the change in budget set or disposable income arising from farm-related decisions. The structure of Irish agricultural taxation policy and recent policy changes in this area are also discussed.

Chapter 5

This chapter compares financial returns arising from a range of agricultural land use options in order to examine the effect of policy instruments on land mobility in Ireland. Irish agriculture is characterised by a lack of land mobility despite a number of policy initiatives, most notably tax exemptions on income derived from the long-term leasing of land. Using socio-economic data from the NFS, a number of hypothetical farms are created using a microsimulation approach to compare incomes across farm systems and land use options. Tax and subsidy policies are applied to derive rates of return for the hypothetical farms under a variety of land use scenarios.

The analysis finds that in numerous hypothetical scenarios, leasing out agricultural land on a long-term basis can prove more profitable for cattle and tillage farmers than farming the land. Only dairy farmers obtain consistently higher disposable incomes from farming their land as opposed to leasing it out. Land can also be a significant cost for new entrant dairy farmers but renting land is not an impediment to profitable dairy farming. However, despite these results, 66% of Irish agricultural land is used for cattle and tillage farming.

Chapter 6

This chapter examines attitudes amongst Irish farmers toward land mobility, as well as openness to various forms of land transaction. The analysis is based on a nationally representative survey of 846 Irish farmers. A logistic regression model is used to examine farmers' willingness to enter the land market through leasing in land, leasing out land, buying land or selling land. Results show that farmers are more open to adding land than releasing it, with 51% willing to add land while 28% willing to release land.

Four attitudinal variables are identified using principal component factor analysis and are predictive of willingness to enter the land market. Farmers motivated by the pleasure of farming are more likely to demand land while farmers of an innovative nature are

more likely to be willing to supply land. Conservative farmers are unlikely to be open to either supplying or demanding land. Dairy farmers and farmers with a high stocking rate are open to adding land while cattle farmers are more open to supplying land. Other factors such as age, income from farming and the presence of a successor influence farmers' willingness to enter the land market. Contrary to popular belief, farmers are willing to enter the land market on both the supply and demand sides in Ireland.

Chapter 7

The objective of this chapter is to gain insight into Irish agricultural land rental markets by estimating farmers' willingness to pay (WTP) and willingness to accept (WTA) for land attributes. A discrete choice experiment (DCE) methodology is used to allow for the estimation of farmers' WTP and WTA for land attributes and to rank attributes in terms of importance to farmers. The land attributes used in the DCE are the type of rental contract (whether conacre or lease); the distance of the land from the farmyard (adjacent, 1km or 5km away); the quality of the land's soil (good, medium or poor) and the rental price (€100 – 600).

Farmers could choose between two land rental alternatives or a status quo option. 846 farmers were surveyed, with the sample split between two DCEs: one asking about renting land in and one asking about renting land out. The results are analysed using a multinomial logit (MNL) and a random parameter logit (RPL).

The MNL model showed that distance, soil type and price are significant predictors of renting in land, while contract type (conacre or lease) is a significant predictor of renting out land. The RPL model shows significant preference heterogeneity amongst the respondents in both the 'Rent In' and 'Rent Out' models. In the RPL 'Rent In' model, leasing is preferred to conacre, good soil is preferred to poor soil but farmers are indifferent between medium and poor soil and land 5km away is preferred to land 1km away. The higher the rental price, the less preferred the land is. In the RPL 'Rent Out' model, leasing is preferred to conacre, farmers would prefer to rent out land the further away from the farmyard it is, farmers would prefer to rent out land with worse soil and would prefer to rent out land at a higher price.

Chapter 8

The results from the preceding chapters are summarised in Chapter 8. The key findings and contributions of the thesis are presented along with limitations of the work and areas for future research. Examples of how research from this thesis has been disseminated are also provided.

Chapter 2. Theory of Agricultural Land Markets

In this chapter, the economic theory of agricultural land markets is explored. The rental price of farmland has played an important part in economic theory since at least the time of Smith, Ricardo and Malthus. The theories of the Classical economists still influence modern neoclassical theory of land economics, although land is no longer considered a unique factor of production as it once was. Modern agricultural land economics is based on the theories that the rental price of land is equal to the marginal product of the land and that land prices are equal to the present value of the stream of future rents. This chapter outlines these theories and how they influence land markets. Consideration is also given to land market imperfections and how land markets often function less efficiently in reality than in theory.

2.1 HISTORY OF AGRICULTURAL LAND IN ECONOMIC THOUGHT

From ancient times, land has played a central role in economic analyses and writings. The emergence of the Classical economists in the 18th century marked one of the first formal treatments of land as an economic factor of production (Hubacek & van den Bergh, 2006). Although previous writers such as Richard Cantillon, William Petty and Francois Quesnay had put forward ideas on the contribution of land to the economy, Adam Smith provided the building blocks for how Classical theorists thought about land, and especially, rent.

Classical economists afforded a significant role to the agricultural sector in the economic system, as fitted the circumstances of the time. When Smith wrote *An Inquiry into the Nature and Causes of the Wealth of Nations* in 1776, the Industrial Revolution had barely begun. This helps to explain Smith's conviction that the produce of the land was the principal source of revenue and wealth for every country (Blaug, 1996).

For the Classical economists, the economic system was based on three socio-economic groups: landowners; capitalist tenant farmers; and landless labourers. Landless labourers provided the farm work while tenant farmers advanced the capital employed in the production process. The surplus that arose from production was partly paid to landlords as rent, with the remainder retained by farmers as profit. This profit represented a return on capital for the tenant farmer. Classical economist David Ricardo

explains the Classical framework in the opening paragraphs of his book *On the Principles of Political Economy and Taxation* (1817):

The produce of the earth – all that is derived from its surface by the united application of labour, machinery and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated.

But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profits and wages, will be essentially different; depending on the actual fertility of the soil, on the accumulation of capital and population and on the skill, ingenuity and instruments employed in agriculture. To determine laws which regulate this distribution is the principal problem in Political Economy (p.5).

Smith described rent as “the produce of those powers of nature, the use of which the landlord lends to the farmer” (as cited in Currie, 1981, p.11). In Smith’s view, almost all land yielded a surplus of food over and above that needed to ensure its continued cultivation – that is, over and above that needed to first, replace the capital advances including wage payments to the workers, and second, to provide the tenant farmers with the normal rate of profit on that capital. Landlords appropriated the surplus by means of monopoly power. Therefore, Smith’s basic theory of rent was that the ‘normal’ or natural rent level was that which left the farmer with the normal or natural profit on capital advances. For Smith, the normal rate of profit was determined in the economy at large by the forces of supply and demand.

Smith was the first to provide a basic structure for a Classical theory of rent. Subsequent Classical theories drew on work by James Anderson, James Steuart and Jacques Turgot, especially their theories of the intensive and extensive margin and the hypothesis of diminishing returns. These concepts were developed by Robert Malthus and especially David Ricardo into a celebrated Classical theory of rent (Currie, 1981).

In Ricardo’s theory, there are two reasons for rent: unequal fertility and scarcity of land. Ricardo assumed a giant farm producing wheat by applying homogeneous labour to a fixed supply of land subject to diminishing returns. Ricardo believed land was an

inexhaustible and non-reproducible agent, unalterably fixed in supply, completely specialised in production of one crop and homogeneous in quality, except for differences in fertility and location (Blaug, 1997).

Differences in land's utility were responsible for his concept of 'differential rent'. He stated that "if all land had the same properties, if it were unlimited in quantity, and uniform in quality, no charge could be made for its use" (Ricardo, 1817, p.41). The second reason for the existence of rent was scarcity of land – if land was of identical quality, limitations of supply would create 'scarcity rents'.

Ricardo believed labour and capital shift from one unit of land to another but land itself never shifts between alternative uses. As land has no alternative uses, rental payments do not affect the supply price of agricultural products: "Corn is not high because a rent is paid, but rent is paid because corn is high". (Ricardo, 1817, p.44) With Ricardo's systematic development of the labour theory of value, rent is explained entirely in terms of labour. The exchange values of agricultural goods are determined by the capital and labour costs applied to marginal land.

John Stuart Mill in his *Principles of Political Economy* (1848) extended Ricardo's theory by taking into account the competing uses of land by agriculture, mining, residence, and manufacturing and applying the concept of rent to production in general. Mill saw land not as merely a factor of production but also as a provider of amenity services, emphasising quality of life and the experience of natural beauty (Hubacek & van den Bergh, 2006).

Malthus tried to demonstrate that rent constitutes a genuine addition to wealth rather than a mere transfer of purchasing power as Ricardo claimed. Starting from the same theory of rent, Malthus and Ricardo arrived at opposite interpretations with Malthus arguing that the rent of land owed its existence to the land's productivity while Ricardo arguing that rent existed due to the scarcity of land.

Malthus's *Essay on Population* (1798) related resource scarcity in terms of the limited supply of land to his theory of population growth. As the labour force increases, extra food could only be produced by extending cultivation to less fertile soil or by applying capital and labour to land already under cultivation, with diminishing results arising from the so-called law of diminishing marginal returns.

In *The Isolated State* (1826), Johann Heinrich von Thünen looked at land through the central concept of distance. He used the idea of distance to determine the principles that explain the prices farmers receive for their products, the rents that are earned and the patterns of land use that accompany such prices and rent.

Von Thünen modelled the pattern of agricultural production around the central town in an isolated state, in a homogenous featureless plain of equal fertility. Von Thünen developed a system of concentric circles, in which bulky or perishable goods are produced closer to the city and vulnerable or durable goods are imported from further distance. In the central town, the price of a product like grain is determined by the production and transportation costs from the most distant farms whose produce is required to satisfy the town's demand. As grain must sell at the same price irrespective of production location, ground rent is highest in the first concentric circle and decreases with distance.

For the Classicists, land occupied a special role in the production process. However, the special role of land in economic theory as a factor of production came under pressure in the late-19th and early 20th century. As a result of the political decline of the landlord class and the further development of industrialism, capitalists and industrial labour became the sources of attention for economists (Daly & Cobb, 1989). The irrelevance of land was also put forward by contemporary American economists who tended to deny the classical law of diminishing returns and the Malthusian theory of population. These theories seemed to contradict the facts of life in the 'New World': abundance of land; flexible ownership and tenure; and value related through competition and the market (Hubacek & van den Bergh, 2006). As the 'neoclassical revolution' took over, the perception of land changed from one where land had a unique role in the production process to one where it was just like any other capital good.

2.2 MODERN LAND MARKET THEORY

Although land no longer has the special place in economic theory that it once possessed, the insights of Ricardo and von Thünen continue to inform modern theories of land markets. Ricardian rents explain the role of land quality in land rents and why higher quality, more productive land commands higher rents. Following Randle and Castle (1985), it is assumed that land comes in various qualities, with land quality being

expressed in a single dimension F , $0 \leq f < \infty$, where larger values for F indicate higher levels of soil fertility.

Assuming a single crop, output z_I is a function of labour (l), land (h) and soil fertility (F):

$$z_1 = f(l, h, F). \quad (1)$$

In general, $(\partial^2 f / \partial L)(\partial F) > 0$ and $(\partial^2 f / \partial h)(\partial F) > 0$, i.e. increasing land fertility has a positive influence on the marginal productivities of both labour and land. The homogenous production function can be expressed in per hectare terms so that $z_I = z_I/h$ and $L = l/h$:

$$z_1 = a_1 f(L, F), \quad \frac{\partial f}{\partial L} > 0, \quad \frac{\partial^2 f}{\partial^2 L} < 0, \quad (2)$$

where a_i is a proportionality factor ($a_i > 0$ for all i) characterising the particular crop grown. Per hectare profits π may be expressed as

$$\pi = p_{z1} \cdot a_1 f(L, F) - wL - p_h(F) \quad (3)$$

where p is the price of the output z_I and w is the wage rate. At equilibrium, profits will everywhere be driven to zero. Therefore, when labour use per hectare is optimised at the level L^*

$$p_h(F) = p_{z1} \cdot a_1 f(L^*, F) - wL^*. \quad (4)$$

Restricting $p_h(F)$ to be non-negative, there is some F_{min} for which $p_h(F_{min}) = 0$ and $p_{z1} \cdot a_1 f(L^*, F_{min}) = wL^*$. For $F > F_{min}$, $p_h(F) > 0$ and $p_{z1} \cdot a_1 f(L^*, F) > wL^*$. Partially differentiating Eq. (4) with respect to F produces $\partial p_h / \partial F = p_{z1} \cdot a_1 \partial f / \partial F$. Since $\partial f / \partial F > 0$, it follows that $\partial p_h / \partial F > 0$.

Land rents are positive and increase with soil fertility for $F > F_{min}$. At $F = F_{min}$, land rents are zero. At $F < F_{min}$, revenue is less than labour cost at the optimal factor combination. So land with $F < F_{min}$ is abandoned and output there is zero. If demand for z_I was to increase, thereby increasing the price of output p_{zi} , a new solution, F'_{min} , would be found for the zero rent fertility level, that $F'_{min} < F_{min}$, and that $p'_h(F) > p_h(F)$ for all $F > F'_{min}$. Increased demand for crops results in cultivation of lower quality land at the margin and increased rents for all super-marginal land.

Land rents are linked to land prices through the capital asset pricing model. Here, land is treated as a marketable asset, valued only for its usefulness as a factor for producing a time stream of goods. In this case, those goods are agricultural commodities z subject to the production function $f(z, x, h, L)$ where x is the amount of inputs other than land and labour and $z, h,$ and L are as previously defined. The rent accruing to the land is defined as $p_h = (p_z \cdot z - p_x \cdot x - wL)$ in the timeless context. Introducing time, the present value of an indefinitely long stream of rents starting in $t = 0$ is:

$$W_0 = \int_0^{\infty} e^{-rt} [p_h(t)] dt \quad (5)$$

where r is the real interest rate and d is the discount rate. Therefore, if the land was sold at $t = 0$ and $p_h(t)$ represented the anticipated stream of rents accruing at all subsequent times, its market value as a productive asset would be $p_h^0 = W_0$.

If this land was owned by a producer who planned to sell it at some future time, T , its present value to the current owner would be:

$$W_0' = \int_0^T e^{-rt} [p_h(t)] dt + P_h^T e^{-rT} \quad (6)$$

However, P_h^T must be equal to the present value at T of the anticipated stream of subsequent rents, i.e.

$$P_h^T = \int_T^{\infty} e^{-r(1-T)} [p_h(t)] dt. \quad (7)$$

Therefore, $W_0 = W_0'$. Starting at $t = 0$, a strategy of holding land for a finite period of time, accruing rents during that period and selling the land at the end, is no more (and no less) rewarding than a strategy of holding it for an indefinitely long sequence of production periods. Given an unchanging set of expectations, the price of the asset at any time fully reflects the discounted value of future production (Randall & Castle, 1985).

While Ricardo's model explained land rents and prices in terms of soil fertility, von Thünen was mostly concerned with space and distance. Given that some essential activity, such as market exchange, takes place in a single market city and that an economic activity such as farming takes place on land outside of that city, how will distance to the city affect a farm's output, the intensity of labour use and the rent

accruing to land? By considering a single crop, the neoclassical production function is expressed as:

$$z_1 = a_1 f(L), \quad \frac{\partial f}{\partial L} > 0, \quad \frac{\partial^2 f}{\partial^2 L} < 0. \quad (8)$$

While D , distance from the city, does not influence directly the production process, it does influence profits:

$$\pi = (p_{z_1} - s_{z_1} D) a_1 f(L) - wL - p_h(L; D) \quad (9)$$

where $s_{z_1} D$ is the unit transportation costs of output z_1 to the city. At the zero-profit equilibrium, land rent is equal to revenue (net of transportation costs) minus labour costs:

$$p_h(L; D) = (p_{z_1} - s_{z_1} D) a_1 f(L) - wL. \quad (10)$$

When labour use is optimised, it is found that labour use declines with distance and that labour use diminishes to zero at

$$\bar{D} = p_{z_1} / s_{z_1}, \quad (11)$$

which implies that land beyond \bar{D} is abandoned.

It follows that since $\partial f / \partial L > 0$ and $z_1 = 0$, that output z_1 decreases with distance from the city and falls to zero at the critical distance, \bar{D} . Furthermore, it can be seen from Eq. (10) that land rent is zero when L and z_1 are zero at and beyond \bar{D} . Differentiating Eq. (10) with respect to D , $\partial p_h / \partial D$ is found to be directly proportional to $(\partial f / \partial L)(\partial L / \partial D)$, which is negative. Therefore, land rent decreases with distance.

Employment, output and land rent (all in per hectare terms) are positive near the city and diminish with distance, reaching zero at \bar{D} where unit transportation costs $s_{z_1} D$ equal product price. If the product price were to rise relative to transport costs, some more distant land would be brought in to production, increasing total output, raising land rents and the intensity of labour use nearer the city.

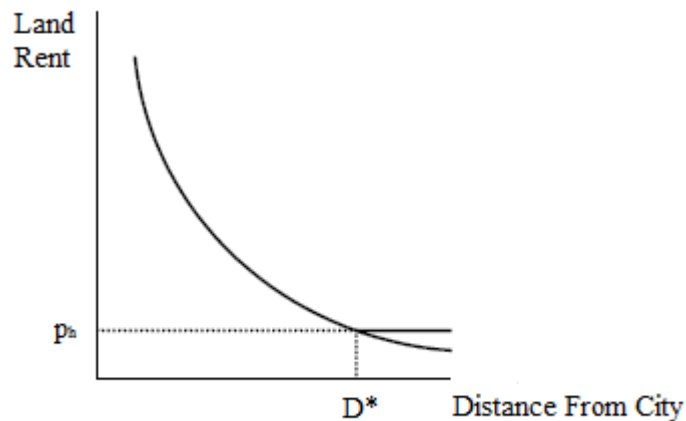
The model can be extended to show that if multiple commodities are produced, commodity zones arrayed from the city centre will form. Each commodity will have only one zone of production and the zones will be arranged in order of decreasing

product weight. The sharpness of the zone boundaries will mean that although land rents decline continuously from the city centre outward, there will be rent price kinks at the zone boundaries.

The von Thünen framework has been adapted over time to explain how land markets determine land use. Alonso's bid rent theory extended the ideas of von Thünen to explain the relation between urban land use and urban land values but also gives insight into agricultural land markets (Alonso, 1964; Buurman, 2003; McCann, 2001). The bid rent theory for business location states that in order to maximise profits, firms need to ship their final products or inputs to and from von Thünen's city centre. For the production of goods, land and capital are substitutable with business owners optimising their inputs, capital and land, so that they are employed at the minimum average cost. If a business locates at a point further from the city centre, higher transportation costs must be compensated by lower land rental costs. Due to capital substitution, a rent curve similar to Figure 2.1 can be found for businesses. The bid rent theory is also used to determine residential land prices in a similar manner.

Agricultural rents, and by extension farmland prices, are determined in a different way from urban land rents (Buurman, 2003). The rent a farmer can pay is the same as that formulated by von Thünen in Eq. (10). The crop that produces the highest revenue at a certain location will be able to make the highest bid for a piece of land. The land is rented (or sold) to households or firms if their bid is higher than the agricultural bid, which will be the case in close proximity to the city centre. The city limit will be the location where the agricultural bids equal the bids from households or firms. In Figure 2.1, this is location D^* , where p_h is the rent for land that is used by agriculture.

Figure 2.1 Bid Rent Curve



Source: Buurman (2003)

2.3 ECONOMIC MODEL OF THE AGRICULTURAL LAND MARKET

As shown in the previous section, microeconomic theory suggests that profit-maximising firms, e.g. farms, will add units of a factor of production (in this case land) up to the point where the price of the factor of production equals the value of its marginal product. Therefore, neoclassical economics suggests there is no reason that the market mechanisms of supply and demand cannot determine the price for land. The interaction of supply and demand is presented here in an economic model of the agricultural land market, based on the work of Higgins (1979) and Currie (1981).

If a firm is profit-maximising, it will add units of a factor of production until the price of the factor equals the value of its marginal product. It can be implied that a profit-maximising firm would add units of land up to the point where the price paid for it was equal to the sum of the present value of the expected marginal value product of the land and the present value of the expected appreciation (or depreciation) in the value of the land over the period for which the land is held. Assuming that land will only be used for agricultural purposes, demand for land can be affected by the purchaser's expectations about the rate of growth in income from land, the purchaser's expectations about the rate of growth in land values, the purchaser's discount rate for pure time preference and the length of time the purchaser plans to hold onto the land.

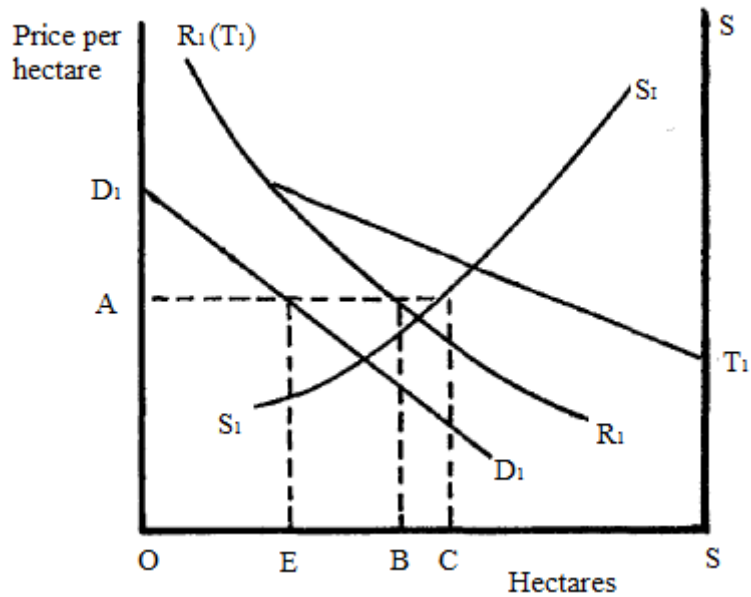
The demand schedule for land, i.e. the quantities of agricultural land that people wish to hold at different prices, can be separated into two components: reservation demand and

acquisition demand. Reservation demand refers to demand by landholders for their own land and represents the difference between the total fixed stock of land and the quantity of land which landholders wish to offer for sale. Acquisition demand is the demand for land by those who wish to become landholders or those who wish to add to their existing stock of land.

Assuming that all land has an owner, at a given price, some landowners will wish to offer their land for sale while the remainder will wish to hold onto their land. Those who offer their land for sale are suppliers of land to the market and the quantity of land they wish to sell can be called the offer supply of land. At the given price, those who wish to hold onto their land account for reservation demand.

In Figure 2.2, SS represents the stock of land and S_1S_1 is the offer supply of land. The reservation demand (R_1R_1) is the difference between the stock of land and the amount of land which landowners wish to offer for sale at each price. Thus, at price A , landholders wish to sell OC hectares of their land stock and wish to hold the remainder, CS hectares. CS hectares are equivalent to OB hectares, which represent the reservation demand at this price. Adding the reservation demand to the acquisition demand (D_1D_1), the total demand curve (T_1T_1) is obtained. Due to the way the total demand curve and the offer supply curve are constructed, the total demand curve will intersect with the stock supply curve at the same price as the acquisition demand curve intersects with the offer supply curve.

Figure 2.2 Demand and Supply Curves for Land



Source: Higgins (1979)

To understand the factors that cause changes in the price of land and in the quantity of land sold, it is necessary to know the factors that affect both the acquisition demand and offer supply curves. Factors affecting land demand have been outlined previously so attention here turns to factors affecting supply. The elasticity of the supply curve is determined to the degree to which landholders perceive other income earning assets to be substitutes for land. In a situation where landholders perceive other income earning assets to be a good substitute for land, then a small increase in the price of land, *ceteris paribus*, would lead to a relatively large increase in the supply of land to the market, i.e. the land supply curve would be relatively elastic at that price. Where landowners do not believe other assets would be a good substitute for land, the land supply curve would be relatively price inelastic. Price elasticity of supply can also be affected by the landholder's expectations about future land prices. If an increase in the price of land only has a small effect on the landholder's expectations about the future price of land, then the price elasticity of supply can be said to be relatively elastic. Therefore, the more elastic price expectations are, the more inelastic the supply curve of land will be.

In addition to price elasticity, land supply can be affected due to factors that cause shifts in the offer supply curve. Factors that shift the supply curve include expectations about the future prices of land, changes in the expected returns from land relative to the

expected returns from income-earning land substitutes and changes in landholders' preferences for holding land relative to other assets.

A *ceteris paribus* upward shift in expectations about future land prices should shift the offer supply curve to the left ($S_I S_I$ in Figure 2.2). At a given current price, more landholders would want to hold onto their land after such an upward shift in expectations about future land prices. If landholders expect returns from land to increase relative to returns from other substitutable assets, then at a given land price, it would be expected that more landholders would want to hold onto their land and less land would be offered for sale. This can be thought of as a rightward shift in the reservation demand curve and a leftward shift in the offer supply curve. A change in landholders' preferences away from other assets and toward land will cause a leftward shift in the offer supply curve.

The model of the land market can therefore be summarised in the following set of general equations:

$$Q^d = f_d(P_L D_S) \quad (12)$$

where Q^d is the quantity of land demanded (acquisition demand), P_L is the price of land and D_S is a vector of variables that shift the acquisition demand curve;

$$Q^s = f_s(P_L S_S) \quad (13)$$

where Q^s is the quantity of land supplied to the market and S_S is a vector of variables that shift the market supply curve (offer supply);

$$Q^d = Q^s \quad (14)$$

which represents the market equilibrium condition:

$$\frac{\partial Q^d}{\partial P_L} < 0 \text{ and } \frac{\partial Q^s}{\partial P_L} > 0 \quad (15)$$

which represent the price elasticities of the acquisition demand and offer supply curves.

2.4 AGRICULTURAL LAND MARKET IMPERFECTIONS

In order for agricultural land markets (or any market) to be efficient, neoclassical economics assumes a perfectly competitive market under the following conditions (Shearer, 1990):

- A substantial number of buyers and sellers so that no single purchase influences the price and an individual's demand or supply may increase or decrease without affecting prices;
- Homogeneous units to ensure that buyers and sellers are indifferent about from whom they buy or to whom they sell;
- Easy and equal access for buyers and sellers to information about current transactions, including prices and bids;
- No influence of customary and institutional rules on the distribution of resources among prospective buyers and land sold to the highest bidder;
- Complete freedom of entry and exit from the market for both buyers and sellers; free movement of resources into uses which are in great demand, thus replacing inefficient resource users with efficient ones.

While these ideal market conditions rarely exist in most factor markets, they are especially unlikely to exist for agricultural land markets. This section outlines the many market imperfections that have been detailed in the literature that prevent farmland markets from working as efficiently as is assumed in the previous sections.

Although numerous factors can inhibit agricultural land markets from operating efficiently, Ciaian et al. (2012a) detail six primary factors that can affect the economic efficiency of land markets: agricultural policy measures; land market institutions and regulations; transaction costs; credit market imperfections and farm profitability; alternative land uses; and social capital.

Agricultural Policy Measures

In most developed countries, governments intervene in the agricultural sector through policies that both support and shape agricultural production. Foremost amongst these

policies are those that are intended to support farmer income. This support can take the form of market price support, production subsidies, factor subsidies, coupled payments, uncoupled payments etc. While these policies may have many effects, intended or otherwise, one is particularly important in the context of land markets - support payments can become capitalised into land values, making land more expensive to purchase and to rent.

Capitalisation occurs when farmers incorporate the value of government support into their decision-making (OECD, 2008). The market value of assets, such as land, used in agricultural production will reflect expected future earnings to the extent that eligibility for government support is tied to the ownership or operation of those assets. By increasing returns to the land asset, support payments have the effect of increasing rents and as a result, increasing land prices due to land prices being the present-day value of capitalised future rents. Such a policy-induced growth in land values may reduce efficiency in the agricultural sector as entry costs are increased for those who wish to enter the sector. Expansion costs for current farmers also rise. As a result, levels of land exchange amongst current and potential farmers are reduced, pushing up the average cost of production in the agricultural sector.

The classic model for analysing the income distributional consequences of agricultural support policy was developed by Floyd (1965). Floyd's approach demonstrates that market interactions between output and factor markets lead to the impacts of a policy being felt throughout the production system, regardless of the initial incidence of the policy. The literature on support payment capitalisation is divided into studies focusing on coupled payments (where payments are linked to production through the number of animals owned or acreage size) and those looking at decoupled payments (where payments are not linked to production).

Ciaian et al. (2012a) report the main findings of the literature on coupled policy impacts as follows:

- If the supply of land is fixed, then area payments (where more land means more payments) are fully capitalised into land values.

- Coupled production subsidies are fully capitalised into land values if in addition to zero land supply elasticity, either the supply elasticity of non-land inputs is perfectly elastic or factor proportions are fixed.
- Where the previous conditions do not apply, the benefits from coupled subsidies are shared between land and other factors of production. If demand elasticity is not perfectly elastic, consumers also benefit.
- The agricultural policy impact on land values may be very large e.g. fully capturing subsidy payments.

In order to study decoupled subsidies, a new generation of partial and general equilibrium models have been developed to examine the issue (Ciaian & Swinnen, 2006, 2009; Guyomard et al., 2004). The main findings of the theoretical literature on decoupled policy impacts are summarised by Ciaian et al. (2012a) as follows:

- Fully decoupled farm policies have no impact in land values if markets are perfect.
- Decoupled policies may affect land values only in the presence of market imperfections such as transaction costs or credit constraints in the land market.
- The exact impact of decoupled payments on land markets depends upon many factors such as the type of support policy, supply and demand elasticities, accompanying policy measures, market imperfections, land use opportunity cost, institutions and expectations.

The empirical evidence surrounding the impact of agricultural policies on land rents and land values is extensive, with studies mostly focusing on the effect of support policies in the EU and the United States. Studies examining the impact of agricultural policies on land rents include Patton et al. (2008), Kirwan (2009), and Breustedt and Habermann (2011) while studies investigating the effect of agricultural policies on land values include Shaik et al. (2005), Goodwin et al. (2011), and Michalek et al. (2014). In a review of the literature, Feichtinger and Salhofer (2013) found the average elasticity of land prices with respect to agricultural support payments was 0.271, based on 26 articles. In another review, Latruffe and Le Mouél (2009) found the elasticity of land

prices and rents to government payments to be consistently less than one, with the relatively inelastic response being attributed to the uncertain future of farm programme payments.

In addition to support payments for farmers, other government policies may affect land markets such as environmental, rural development and tax policy (OECD, 2008). Where payments are made in compensation for the extra cost of environmental compliance, the impact on production may have the indirect effect of influencing land values, depending on whether the payments over or under compensate the farmer. Environmental programmes that target specific inputs or input usage can be considered a subset of input subsidies (or taxes). The resulting change in farming practices has implications for the optimal mix of production factors, and therefore can indirectly affect land values.

The use of start-up support grants for new farmers and subsidies for early retirement of older farmers within the EU's rural development programme have been shown to affect land markets by boosting intergenerational land transfers between relatives, at least in the short term (Davis, 2009; Zagata & Sutherland, 2015). Land markets can also be affected by tax policies that offer preferential conditions for agriculture. Such policies include exemptions from capital gains tax, preferential treatment regarding income tax and inheritance tax, and reduced annual property taxes (OECD, 2008).

Land Market Institutions and Regulations

Although the institutional aspects of land markets are often noted in regard to developing countries (Binswanger et al., 1993; Deininger & Feder, 2001), institutions and regulations also have an impact on agricultural land markets in developed nations. While land-related institutions and regulations vary markedly from country to country, a recurring thread in the literature is the implicit and sometimes explicit policy preference for family-operated farms (Thomson et al., 2014). Policies resulting from such a policy preference may have the result of 'locking in' a cost structure that, in time, may be increasingly unable to react to changing economic circumstances. In the absence of such regulations, greater economic efficiency could be achieved by allowing market forces to consolidate smaller farms into more efficient larger holdings (OECD, 2008).

Regulations affecting the price of land, such as minimum and maximum prices for land rental, can limit the mobility of land between users since the market cannot easily match

supply and demand by freely adjusting prices. Land market regulations can also have the effect of encouraging ‘grey’ land markets where extra undeclared payments are added to the purchase or rental price in order to secure a plot of land. Such a situation existed in Belgium and the Netherlands where due to maximum rental prices and minimum length tenancies, additional payments were made by farmers ‘in an envelope’ in order to secure land transactions (Ciaian et al., 2012b, 2012c). The growth of these informal land markets forced more liberal forms of rental contracts to be introduced.

Regulations governing the inheritability of land, continuity of tenure and the pre-emptive rights of tenants to buy land can act to limit the supply of land, forcing rental and purchase prices higher than would otherwise be the case. On the other hand, restrictions on land ownership based on nationality, residency criteria or legal status can have the opposite effect, lowering land demand and causing prices to be lower, *ceteris paribus*.

Transaction Costs

In the context of land markets, transaction costs can be divided into two categories: explicit and implicit. Explicit transaction costs are administrative costs associated with renting or buying a plot of land. These costs can include registration costs, notary fees, broker fees, taxes etc. In general, these costs are more associated with sales markets as opposed to rental markets. Implicit transaction costs are the ‘invisible’ costs associated with a transaction such as search costs and bargaining costs. Such implicit costs can arise due to market imperfections such as imperfect competition in the land market, imperfections in property rights, asymmetric information and unclear boundaries between properties (Ciaian et al., 2012b).

On a theoretical level, transaction costs drive a wedge between the price at which an individual may wish to buy or rent land and the price at which a landowner may wish to release it (de Fontnouvelle & Lence, 2002). This wedge can be interpreted as a band of inaction inside which farmers neither buy nor sell land, even with small fluctuations in farmland prices. The band is centred on the price that would prevail in the absence of transaction costs and its width is determined by the size of these costs. As a result, transaction costs create a stickiness or rigidity in farmland markets, with this rigidity increasing the overall volatility of the market price of agricultural land (Moss &

Schmitz, 2006). The band of inaction also reduces the number of market participants, leading to thin markets for land (Chavas, 2003).

A common example of an explicit transaction cost is tax on the sale and purchase of land. In the EU, such taxes vary widely from country to country with taxes being paid by the buyer, the seller or both in some instances. An extensive report on land transaction taxes in the EU is provided by Ciaian et al. (2012b). Such taxes increase the costs associated with transacting land, thinning land markets and hindering structural change in the agricultural sector by inhibiting the reallocation of land from less productive to more highly productive farms. It can also be argued that in a situation where there are low costs associated with land transactions, it is possible that there may be more purchases of land for speculative purposes by non-agricultural investors. Such high transaction costs in land sales markets may lead to an increase in land rental transactions, where transaction costs are typically much lower (Swinnen et al., 2006).

Empirical evidence concerning the extent to which explicit transaction costs increase land purchase prices vary by the region being studied. In a review of American agricultural land markets, de Fontnouvelle and Lence (2002) claim that costs incurred in transferring ownership of agricultural land are typically in excess of 7.5% of the purchase price. Studies on land markets in Poland, Bulgaria, Lithuania and Romania estimate explicit transaction costs such as notary fees, taxes and assorted administrative charges to be between 10% and 30% of the value of the land transaction (Ciaian et al., 2012b).

Implicit transaction costs in land markets may arise due to a number of factors. In developing and transition nations, imperfections in property rights such as unresolved land ownership, land co-ownership or inability to enforce property rights due to poor institutions may impede land markets from working properly (Dale & Baldwin, 2000; Deininger & Feder, 2001; Vranken & Swinnen, 2006). Imperfect competition in land markets can also arise due to the domination of the land market by large landholders and corporate farms. Dominant actors can use their market power to influence land prices and rental contract conditions in their favour (Swinnen et al., 2006). Search and bargaining costs can also arise for actors on both sides of the land transaction. Those buying or selling land privately rather than through a broker or real estate agent are required to take on the services a broker would provide such as appraisal, search,

advertising, information provision etc. Thompson and Whiteside (1987) found that in South Carolina, farmland marketed by real estate firms averaged prices about 10% higher than farmland sold privately. Their results suggest that implicit costs in private sales can be equivalent to or higher than explicit brokerage costs.

Credit Market Constraints and Profitability

Poor access to capital can be a major constraint for both land sales and land rental markets. Lack of farm profitability and imperfect credit markets both constrain farmers' access to credit. Capital market imperfections may constrain land markets in several ways. First, where capital markets work imperfectly, land purchases typically have to be financed out of own savings. Second, where financial markets do not work well, or where confidence in money as a store of value is low, land may be used to protect wealth and may be acquired for speculative reasons. Third, land may be held as a hedge against inflation or as an investment asset in the absence of other investment or hedging options. Fourth, with constrained access to credit, investment in land ties up much needed capital, preventing farmers from alternative farm investments such as technology, equipment or quality inputs. Collectively, these factors mean that the sale price for land will typically be higher than the productive use of the land (Ciaian et al., 2012a).

Farmers may also face differential credit access depending on the amount of land that they own. Due to asymmetric information and moral hazard, quantity rationing may occur in credit markets (Stiglitz & Weiss, 1981). Credit markets may overcome these problems by imposing a collateral requirement on borrowers. Farmers typically use their owned land as collateral. As a result, the supply of credit depends on the amount of land owned, which is likely to confer a credit advantage to large landowners over smaller ones. Landless farmers who rent all of the land that they farm are at a further credit disadvantage. Furthermore, transaction costs are often higher for smaller scale farmers due to the fact that transaction costs tend to decrease with loan size (Petrick & Latruffe, 2003).

The profitability of agriculture also plays a role in land markets, especially where credit markets are imperfect and land transactions must be financed out of savings. Where low farm profitability is present, it can act as a barrier to entering land markets. Jansson et

al. (2013) found that when considering extending credit to farmers, financial institutions in the EU placed greater importance on the farm's cash flow rather than the amount of assets that could be used as collateral. Such profitability issues can also be connected to agricultural policy since agricultural subsidies can reduce the level of credit constraint farms experience, thereby allowing greater access to credit. Increased land prices may result if farmers choose to invest their newly found credit in land.

Alternative Land Uses

Generally, land can be used not only for agriculture but also by other sectors of the economy. Under such circumstances, land values will reflect this potential alternative land use. Where the non-agricultural use of the land is expected to be profitable in the future, the current land price will reflect the sum of the discounted stream of rents from agriculture up to the time of conversion plus the discounted stream of expected rents from the non-agricultural use of the land from that time onwards (Plantinga et al., 2002).

In a review of European land markets, Ciaian et al. (2010) report the role of urban pressures, infrastructural expansion and tourism on farmland prices. In Spain, farmland prices have been driven by the pressures of tourism and urban development. Pressure from tourism had a significant impact on both sales and rental rates while urban pressures solely affected sales prices. In highly urbanised, densely populated countries such as the Netherlands, land prices are greatly influenced by the implicit call option that is embedded in the land price - the option to develop land outside agriculture. This factor also led to large price rises for agricultural lands in Ireland during the 2000s.

Zoning laws are often used by governments to control the conversion of agricultural land into another use such as housing, industry, recreation etc. Such laws usually distinguish land into multiple land use classes, setting up multiple land markets which can influence each other. Land in an urban (red) use class typically yields a higher return than land in agricultural or nature use classes (green) but societal preferences may require the preservation of 'green' land. Zoning laws are used to prevent 'red' encroachment into 'green' space. Farms in areas that are expected to become 'red' in the future will be of increased value today in order to reflect the higher price the land may have in the future. Therefore, zoning into 'red' and 'green' areas can distort

markets by creating economic winners and losers: if land is situated in an area that is destined to stay (or become) ‘green’, its value will be lower than that of its counterpart situated in a ‘red’ area (OECD, 2008).

Social Capital

In addition to economic factors, land markets can be subject to social and cultural influences. Transactions can be affected by the nature of the relationship between parties, as well as the societal norms and cultural context within which the transaction takes place. Social capital can be defined as a person’s or group’s sympathy toward another person or group that may produce a potential benefit, advantage, or preferential treatment for another person or group of persons beyond that expected in an exchange relationship (Robison et al., 2002). Such social capital can influence land transactions in ways that would not be predicted by standard neoclassical models.

The vast majority of land market transactions take place between family members or friendly neighbours, with such individuals receiving price discounts compared to strangers (Kostov, 2010; Perry & Robinson, 2001; Robison et al., 2002; Tsoodle et al., 2006). The literature shows that these price discounts can range from 6% (Siles et al., 2000) up to 43% (Tsoodle et al., 2006). A farmer’s propensity to purchase land can also be influenced by how much land the farmer has compared with neighbouring farmers. Farmers with less land compared with neighbours may be more likely to buy land than when a more equal local land distribution exists (Falkowski, 2013). The type and length of land rental contracts can also be socially influenced. The longer the duration of the relationship between a landlord and a tenant, the more likely the landlord is to offer lower rental prices and share operating costs with the tenant (Rainey et al., 2005).

Outside of how social and cultural factors affect the type and nature of land transactions, consideration must also be given to how these factors influence the amount of land that comes on the market. The emotional attachment farmers have to their land is a long observed and well-studied phenomenon, especially within the sociological literature (Cheshire et al., 2013; Gray, 1998; Hildenbrand & Hennon, 2005; Quinn & Halfacre, 2014). Due to the position of the family farm as the dominant form of agricultural entity, land has largely been handed down within the family over a number of generations (Lobley et al., 2012). As a result of these patterns of succession and

inheritance, the farm and its land come to be associated not simply with the current farmer of the land but the farm family as a whole, past, present and future (Burton, 2004). The land can become intertwined with the identity of the farm family, becoming a source of symbolic and social capital for the family. When land becomes associated with such deep cultural and historical forces, the symbolic and social capital connected with the farmland can be as important to a farmer as the land's economic value (Burton, 2004).

As a result of cultural and historical elements associated with land, farmers are often reluctant to let land leave 'the family name' (McMillan Lequieu, 2015; Potter & Lobley, 1992; Price & Conn, 2012). In terms of land markets, the tendency of some farmers to see land as more than just an economic factor of production has the effect of restricting land supply, increasing both land sale and rental prices. In addition to restricting land supply, social and cultural factors can increase demand for land in some circumstances. Land ownership can act as a foundation of political power, as well as a source of social status and prestige (Albertus, 2017; Baland & Robinson, 2008; Binswanger et al., 1995). This can especially be the case in developing nations where few alternative investments exist and land may act as a store of wealth (Deininger, 2003).

2.5 CONCLUSION

This chapter looks at the economic theory of agricultural land markets, as well the imperfect nature of land markets in reality. Agricultural land played an important role in Classical economic theory, especially with regard to theories of rent. Adam Smith thought of rent as a monopoly price appropriated by landlords from the surplus generated by the land. David Ricardo built on Smith's theories, believing rent was equal to the economic advantage obtained by using land as productively as possible, relative to the advantage obtained by using marginal (i.e., the best rent-free) land for the same purpose, given the same inputs of labour and capital. Johann Heinrich von Thünen used the concept of distance to explain agricultural land use and land rents.

Modern neoclassical theory conceives of rent as equal to the marginal product of the land, with land prices being equal to the present value of the stream of future rents. As a result, a profit-maximising farm will add land until the land price equals the present value of the expected marginal product of the land plus the present value of the

expected appreciation (or depreciation) in the value of the land over the period the land is held. Assuming that land will only be used for agricultural purposes, demand for land can be affected by the purchaser's expectations about the rate of growth in income from land, the purchaser's expectations about the rate of growth in land values, the purchaser's discount rate for pure time preference and the length of time the purchaser plans to hold onto the land. Factors affecting land supply include expectations about the future prices of land, changes in the expected returns from land relative to the expected returns from income-earning land substitutes and changes in landholders' preferences for holding land relative to other assets.

Efficient land markets presume ideal market conditions, a scenario that rarely exists in reality. As a result, farmland markets are often imperfect in a number of ways. Agricultural policy measures can distort land markets when agricultural support payments get capitalised into land values. Land market regulations can inhibit land mobility when price controls prevent prices from adjusting to match supply and demand. Transaction costs, both explicit and implicit, can make land markets thinner by driving a wedge between the price an individual may wish to buy or rent land at and the price at which a landowner may wish to release it. Credit market constraints may make it impossible for certain farmers to enter the land market. Farmland prices can also be influenced by alternative, non-agricultural land uses which can be built into land prices. Finally, land markets can be subject to non-economic factors such as social and cultural influences, which can affect levels of land supply and demand.

Chapter 3. SOCIO-ECONOMIC DRIVERS OF LAND MOBILITY IN IRISH AGRICULTURE

In this chapter, the current land structures associated with agriculture in Ireland are explored. The Teagasc National Farm Survey (NFS) is utilised to describe current land structures with a focus on farm system, farm size and soil type. Understanding these structures can help to identify the capacity of Irish agriculture to meet current and future policy targets in terms of increased agricultural output, especially in the area of dairy farming. Recent patterns of land mobility through land rental and land sales are also investigated. The research indicates that given current land structures, Irish farmers will struggle to meet stated policy targets and that better incentives to encourage the mobility of land between farmers should be developed.

3.1 INTRODUCTION

The removal of the milk quota for EU farmers in 2015 represents both a period of change but also opportunity for European farmers. Unlimited milk production allows EU countries that possess a comparative advantage in terms of dairy production to fully capitalise on that advantage for the first time in over 30 years. One such country is Ireland, where a combination of a grass-based feeding system and large amounts of productive land should allow scope for increased dairy production. Irish public policy targets such as Food Harvest 2020 (FH2020) and Food Wise 2025 (FW2025) envisage an increase in dairy milk volume of 50% by the year 2020, followed by continued industry growth in subsequent years. However, meeting these targets, as well as fulfilling climate change and environmental obligations, will pose challenges to current land use and land structures. Land use change may require adjustments in what is formally considered agricultural land use change. Change may mean moving from agriculture to forestry, but may also mean a change in the mix of agricultural activities on a farm, for example, from cattle to dairy. Structural land change may involve changes in farm size and farm fragmentation.

Growth in the dairy sector will require changes to land use and land structures, which may prove difficult given Ireland's low level of land sales (O'Neill and Hanrahan, 2012) and land leasing (Ciaian et al., 2010). While there has been some increase in the average farm size over time, the rate of change is very slow. Much of this increase has been via non-contiguous parcels, with the average land parcel number per farm

increasing over time (Kearney, 2010). A number of public policy initiatives have been introduced including incentivised land leasing, the removal of barriers associated with farm partnerships and farm consolidation stamp relief (Land Mobility Service, 2014).

Nevertheless, the pace of land mobility has been relatively slow. Recent work by Bogue (2013) has highlighted relatively limited understanding of the existence amongst farmers of these policies, as well as the existence of mistrust on the part of farmers in relation to these schemes. It is likely also that the interaction with other schemes such as the Basic Payment System and the Disadvantaged Area Payment may affect behaviour via the capitalisation of subsidies into land values (Latruffe & Le Mouël, 2009) and into reluctance to lease long term (Patton et al., 2008). Low land mobility can impact on land price volatility (Roche & McQuinn, 2001), which can further reduce incentives to trade land. Ireland also shares many of the same issues facing other EU countries in terms of land mobility: increased concentration of land ownership (van der Ploeg, 2015); the inability of young farmers to access land (Hennessy, 2014; Zondag et al., 2015) and increased competition for land use (Rounsevell et al., 2006).

It is important therefore to understand not only current Irish land use and land structures but also the incentives associated with change. Factors that may influence future land use and structures include the agronomic potential of farms, the socio-economic and demographic situation in agriculture and incentives associated with the design of public policy. These incentives may themselves adjust as a result of economic or environmental changes. Achieving changes will require new policy related incentives and/or improved uptake of alternative land structural arrangements such as collaborative farming, share farming, shared milking and contract rearing (Teagasc, 2013). Some of the barriers for land use change relates to the socio-economic characteristics of land use. These factors include current land holdings and structure, current land use and farming characteristics, demographic and socio-economic characteristics and the rate of return to existing alternative land uses.

The objective of this chapter will be to utilise the Teagasc National Farm Survey (NFS) to describe the current land use structure and barriers for land use change in Ireland. It will describe the socio-economic characteristics of farms in terms of their land use (land type x system of agriculture x socio-economic characteristics). From the perspective of meeting FH2020 and future strategic targets, it will look at the potential capacity for

land use change and identify potential socio-economic barriers to change and restructuring. This will inform our understanding of what changes may be required to facilitate land use change to meet the ambitions of Irish agriculture. As Ireland shares many of the same land mobility challenges as other countries across the developed world, this chapter will also give an insight into the issue of agricultural land mobility in general.

In terms of the structure of the chapter, Section 3.2 looks at the history and theory of land mobility and transfer. Section 3.3 considers the current pattern of land holdings in Ireland in terms of land use and land tenure and how the situation has changed over time. Following this, Section 3.4 examines how agricultural land rents and values have evolved over time. Section 3.5 of the chapter describes the socio-economic drivers of land access and how these relate to the potential future expansion in dairy farming. Finally, Section 3.6 examines the implications for land mobility policy and future dairy expansion.

3.2 THEORY AND RESEARCH QUESTION

Land markets are driven by supply and demand. Many factors can shift the supply of and demand for agricultural land such as competing uses for land, changes in agricultural productivity, speculative forces, the potential of land to hedge against inflation and land's amenity values (Ciaian et al., 2010; Ciaian et al., 2012a). Individuals also hold land for many reasons besides agricultural production, such as prestige, lifestyle value and family traditions. Land may also be used as a store of wealth in times of high inflation or economic uncertainty.

Generally speaking, farmland is acquired either through attaining ownership (by purchase or inheritance) or through rental. In Western Europe, historical factors largely determine whether the majority of farmed land is owned or rented (Swinnen, 2002). Historically, European countries were dominated by large landlord-small tenant relations with poor tenure security and few tenant rights. In the early 20th century, policy strategies to improve the situation of tenants were enacted. In broad terms, one of two types of policy strategy was implemented. The first strategy was to improve the rental conditions for tenants through regulation and was followed in countries such as Belgium, France and the Netherlands. Rent regulations were introduced primarily with

the aim of improving the tenure security for farmers. As the 20th century progressed, this led to a situation where farmers in these countries no longer wanted to purchase land because their tenure security was very high, and they could use their capital for other investments. In these countries, the rental share is relatively high.

The second strategy was to help tenants become landowners. This was the dominant strategy in countries like Denmark, Italy and Ireland. There, the government set up state funds to purchase farms for poor tenants or to subsidise the latter's purchase of land (or both). In all of these countries, the share of land rental is relatively low. The most dramatic impact occurred in Ireland, where almost all agricultural land was rented at the beginning of the 20th century, having since declined to around 17% in 2010 (CSO, 2012).

Agricultural land rental in Ireland is dominated by the conacre system, which involves land being rented on an 11-month basis. This type of short-term rental of agricultural land is unusual in the European context, with short-term or annual rental contracts being usually associated with developing countries (Deininger, 2009). The dominance of the conacre system goes back to the Land Commission, which was set up by the Land Act of 1881 to adjudicate on the fairness of rents and continued as a tool for implementing land policy following the setup of the Irish Free State in 1922. The leasing of land (excluding 11-month conacre lettings) was subject to the express permission of the Land Commission, with land under longer leases being open to possible seizure by the Commission. Landholders were reluctant to seek permission to let their land under leases longer than 11 months for fear of having such land taken over by the Land Commission (Conway, 1986). Long-term leases, common in European agriculture, have therefore remained relatively rare in Ireland (Ciaian et al., 2010).

Agricultural land rents can be related to agricultural land values using the net present value (NPV) framework (OECD, 2008). The cash rents derived from agricultural land represent the current net value derived from its productive use. In contrast, the sales price of land reflects the benefits derived from the present and future use of agricultural land. Theoretically, if markets are perfect, farmers would be indifferent between accessing land through sales or rental. Additionally, sales and rental prices would be expected to move in parallel. However, this may not be in the case in the presence of market imperfections such as credit market imperfections and transaction costs (Ciaian et al, 2012a). Owing to these imperfections, as well as other factors such as the holding

of land for reasons other than production, land sales prices typically seem higher than the productive value of land. Therefore, it appears that market imperfections reduce the incentives for inefficient producers to sell land while also making it more expensive and difficult for efficient producers to buy land. As a result, sales markets for agricultural land are often thin, with sales prices not necessarily evolving in concert with land rental prices.

In Ireland, only a limited amount of agricultural land comes on the market every year, typically arising from the retirement or death of the owner. As a result, only a tiny proportion of total agricultural land is sold in any given year. Bogue (2013) points to an aversion amongst Irish farmers to selling their farms (only 28% of farmers would consider doing so), as well as a strong desire to see their farm remain within their family (66% of farmers).

Agricultural land availability in Ireland is seen as increasingly important in the light of policy developments such as FH2020 and the removal of the milk quota system in 2015 (Dillon et al, 2008; Läpple & Hennessy, 2012). FH2020 seeks to increase the volume of milk output by 50% by the year 2020, with further expansion likely to be targeted beyond that time. Läpple & Hennessy (2012) simulate post-quota dairy expansion under numerous milk price conditions and express doubts about the likelihood of reaching this target given existing farms and farmland used for dairy farming. Since Irish dairy farmers use a predominantly grass-based production system, this expansion will require a substantial amount of extra land on which dairy cows can graze. Gaining access to this extra land will be important in terms of meeting FH2020 targets as well as enabling sustainable dairy expansion beyond 2020.

Soil and land quality is an important issue in this context. Productive soils are important for successful dairy farms due to the high grass growth rates needed for intensive grazing systems (Lalor et al., 2013). In order for dairy output to increase by targeted levels, productive land will have to become available for use by expanding dairy farmers and new entrants to the sector. A related topic is the productivity of dairy farming compared with other farming systems. It has been shown that dairy farming in Ireland is consistently more profitable than other farming systems such as cattle rearing, tillage and sheep farming (Hennessey et al., 2013). A movement of land that is currently being used for other types of farming to dairy farming could see a huge productivity

gain for Irish agriculture. However, due to Ireland’s low historical rates of land mobility through either rental or purchase, good quality land may be underutilised in productivity terms.

In order to understand the future capacity for development in Irish agriculture, it is important to determine the current position of agricultural land holdings in Ireland. Firstly, the land structure of Irish farms by farm system and by average farm size is examined. Secondly, the degree to which these structures have changed from the mid-1990s to 2011 is studied. Following this, the mechanisms by which agricultural land is accessed by farmers are looked at and the current state of land rental and land acquisition markets is analysed. Finally, it is asked what the state of current land structures means for the capacity of Irish agriculture to develop in future years.

3.3 METHODOLOGY AND DATA

This chapter utilises data from the National Farm Survey (NFS) which is a national farm survey of approximately 1,000 farms conducted every year by Teagasc. The survey data is weighted so as to be nationally representative of Irish dairy, cattle, sheep and tillage farms. In 2011, the survey reported results from 1,077 different farms, of which 1,073 were divided into one of six farming systems: dairy; dairy other; cattle; cattle other; sheep and tillage (see Table 3.1). The NFS also provides data on soil quality with soil being rated on a scale from one to six (one being the highest quality soil, six being the lowest). Soils rated one or two are good quality, those rated three or four are medium quality while soils rated five or six are poor quality.

Table 3.1 Farms by System in the National Farm Survey, 2011

<i>Farm System</i>	<i>Number of Farms</i>	<i>Share</i>
Dairy	272	25.3%
Dairy Other	90	8.4%
Cattle	202	18.76%
Cattle Other	274	25.44%
Sheep	132	12.3%
Tillage	103	9.6%
Total	1073	99.6%

Cattle farming is currently the dominant form of agriculture in Ireland across all soil types, accounting for 57% of land on NFS farms (see Table 3.2). Dairy farming accounts for 14.9% of agricultural land, with sheep farming taking place on 12.3% of land. Tillage farming takes up 8.6% of agricultural area. Figure 3.1 shows how

agricultural land is used on different types of soil. Land with good quality soil makes up the majority of Irish farmland, accounting for 55% of agricultural land. Cattle farming uses the most good quality soil (54.5%), followed by dairy farming (17.1%) and tillage (14.8%). As would be expected, almost all tillage farming takes place on good quality soil. Cattle farming also dominates the use of medium quality soil (64.1%), with dairy farming taking up 14.6% and sheep farming 10.8%. Poor quality soil comprises 11.4% of agricultural land with cattle (46.8%) and sheep (32.4%) farming taking up the vast majority of this type of land. The introduction of incentives for private afforestation has seen more land given over for forestry (DAFF, 2008), especially on land with medium and poor quality soil (see Table 3.2).

Figure 3.1 Land Use on Irish Farms by Soil Type (in hectares), 2011

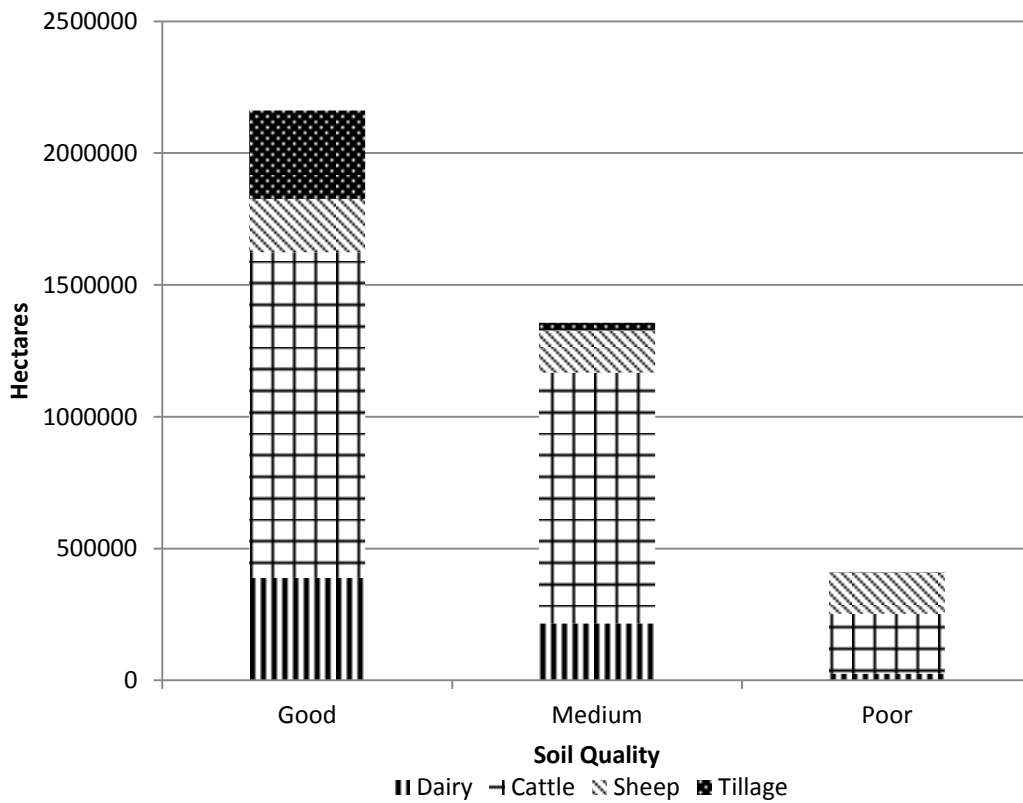


Table 3.2 Land Use Share by Soil Type and Farm System, 2011

<i>Land Use</i>	<i>Dairy Forage</i>	<i>Cattle Forage</i>	<i>Sheep Forage</i>	<i>Tillage</i>	<i>Forestry</i>
Soil					
Good	17.1%	54.5%	8.9%	14.8%	1.4%
Medium	14.6%	64.1%	10.8%	2.0%	2.6%
Poor	5.4%	46.8%	32.4%	0.0%	3.8%
Total	14.9%	57.0%	12.3%	8.6%	2.1%

Although cattle farming uses the majority of agricultural land, Table 3.3 shows that cattle farms are not the largest on average. The NFS breaks down farms into one of six systems: dairy; dairy other; cattle; cattle other; sheep and tillage. Tillage farms are the largest on average, at just over 64 hectares per farm, followed by dairy farms at 54.8 hectares and dairy other farms at 48.9 hectares. Sheep farms are 40.8 hectares on average, with cattle other farms measuring 33.8 hectares and cattle farms being the smallest at 31 hectares per farm. In terms of soil quality, dairy and cattle farms tend to get smaller, on average, as soil quality disimproves. The average size of sheep and tillage farms tends to increase as soil quality deteriorates.

Table 3.3 Average Farm Size by Farm System and Soil Type (in hectares), 2011

<i>Farm System</i>	<i>Dairy</i>	<i>Dairy Other</i>	<i>Cattle</i>	<i>Cattle Other</i>	<i>Sheep</i>	<i>Tillage</i>	<i>Total</i>
Soil							
Good	55.4	59.9	32.4	35.9	38.0	64.3	44.0
Medium	54.1	42.2	28.9	31.3	37.9	68.6	35.6
Poor	52.8	31.4	35.3	33.7	47.6	0.0	40.4
Total	54.8	48.9	31.0	33.8	40.8	64.8	40.3

Average farm sizes are now at their highest level in recent history. In 1996, the average farm size, according to NFS data, was 32.2 hectares. By 2011, this had risen to 40.3 hectares with increases in farm size evident across all systems.

3.4 RESULTS I: PATTERNS OF LAND ACCESS AND TRANSFERS

The manner in which the increase in average farm size has occurred is shown in Table 3.4. Between 1996 and 2011, there has been a movement of land from small farms to larger holdings. The share of total utilised agricultural area (UAA) on farms below 25 hectares has fallen from 23.8% of all agricultural land in 1996 to 16.2% in 2011. Meanwhile, the share of total UAA on farms between 50 and 75 hectares has risen from

16.4% of all land to 20.7% between 1996 and 2011. Over the same time period, the share of land on farms over 75 hectares increased from 24.3% of total UAA to 29.3% of all agricultural land. This movement of land has been driven in particular by cattle and dairy farms. Table 3.4 shows a movement by cattle and dairy farmers to increase in scale by acquiring suitable land. The amount of dairy land on farms over 50 hectares rose from 6.5% of total UAA to 9.6% of total UAA between 1996 and 2011, while the share of land used for cattle farming on farms over 50 hectares increased from 18.4% of total UAA to 23.1% over the same time period. The movement of land from smaller to larger farms matches the pattern of increasing land concentration across the EU (van der Ploeg, et al., 2015). However, this process is happening more slowly in Ireland than in the rest of the EU where holdings of 100 hectares and above now control half of the entire UAA in the EU (Eurostat, 2013). Ireland's illiquid land market may be a reason for this slower rate of land concentration.

Table 3.4 Land Use Share by Farm Size and Farm System, 1996 & 2011

<i>Land</i>	<i>Dairy Forage</i>		<i>Cattle Forage</i>		<i>Sheep Forage</i>		<i>Tillage</i>		<i>Total UAA</i>	
	1996	2011	1996	2011	1996	2011	1996	2011	1996	2011
Year										
Size (Ha)										
<= 25	3.1%	0.7%	15.7%	12.0%	3.0%	2.6%	0.7%	0.6%	23.8%	16.2%
> 25 & <= 50	6.7%	4.6%	20.1%	21.8%	5.0%	4.1%	1.6%	1.3%	35.5%	33.8%
> 50 & <= 75	3.2%	4.4%	8.2%	11.1%	2.9%	1.9%	1.2%	1.3%	16.4%	20.7%
> 75	3.3%	5.3%	10.2%	12.0%	5.3%	3.6%	3.7%	5.4%	24.3%	29.3%
Total	16.3%	14.9%	54.2%	57.0%	16.2%	12.3%	7.1%	8.6%	16.3%	14.9%

The increase in farm size, particularly on land with good or medium quality soils, has been enabled by an increase in renting by farmers. The timeframe between 1996 and 2011 has seen a gradual increase in the share of farmed land being rented with a concomitant decrease in the share of farmed land which is owned by the farmer (see Table 3.5). This is particularly the case for land with good or medium soil. From 1996 to 2011, the share of net rented land with good soil increased from 8.9% to 17.5%, while the share of net rented land with medium soil increased from 10.8% of agricultural land to 14.6%. Bigger farms have driven this rental surge according to the NFS data. The overall net rental rate has increased consistently between 1996 and 2011, with a total increase of 5.7 percentage points over the timeframe. However, Ireland still lags behind the rest of Europe in terms of rental share (Ciaian et al., 2010).

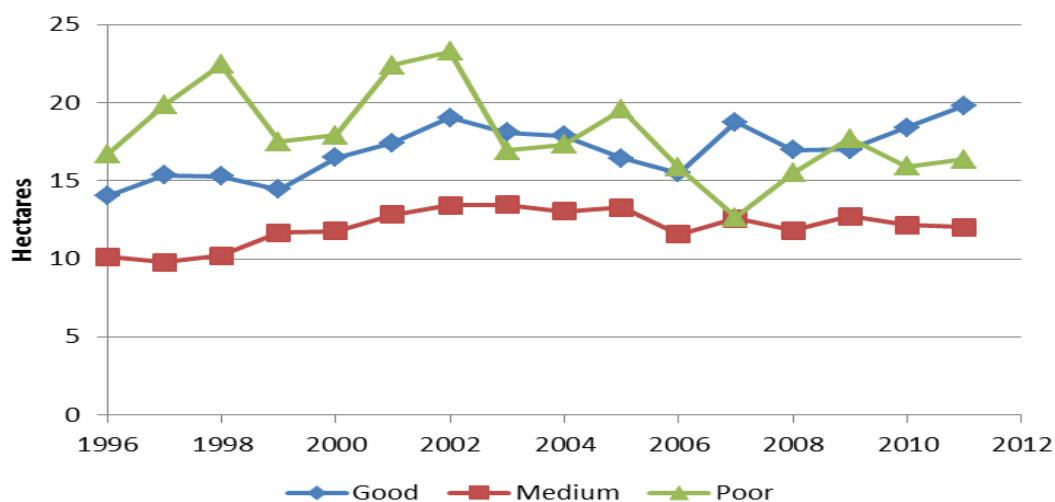
The disparity between the amount of land rented in and rented out by farmers is also notable. It shows that the vast majority of land rented in by farmers is not rented from other farmers. This land may be rented out by landowners who are not interested in farming the land themselves but wish to retain ownership of the land. The improved economic conditions in Ireland in the late 1990's and 2000's may have facilitated this as the offspring of farmers found non-agricultural employment rather than take over the family farm (Meredith & Gilmartin, 2014).

Table 3.5 Owned/Rented Share of Agricultural Land, 2011

	<i>Land Owned</i>		<i>Land Rented In</i>		<i>Land Rented Out</i>		<i>Land Owned (per farm) (Ha)</i>		<i>Land Rented (per farm) (Ha)</i>	
	1996	2011	1996	2011	1996	2011	1996	2011	1996	2011
Year	1996	2011	1996	2011	1996	2011	1996	2011	1996	2011
Soil										
Good	91.1%	82.5%	13.5%	20.0%	4.6%	2.5%	33.8	37.7	14.0	19.8
Medium	89.2%	85.5%	11.8%	15.4%	1.0%	0.8%	28.2	31.9	10.1	12.0
Poor	88.0%	87.6%	12.6%	13.6%	0.6%	1.2%	36.2	37.1	16.7	16.4
Total	89.9%	84.1%	12.7%	17.6%	2.6%	1.8%	31.5	35.3	12.5	16.3

The Irish agricultural land rental market is dominated by the conacre system where land is rented by farmers on an 11-month basis. The average amount of land rented per farm has been increasing steadily over the last number of years, reaching 16.3 hectares per farm in 2011. Farms with good soil have the highest amount of rented land per farm at an average of 19.8 hectares per farm (see Figure 3.2). Farms with poor soil rent 16.4 hectares on average, while those on medium soil rent an average of 12 hectares of land.

Figure 3.2 Average Land Rented per Farm by Soil Type (in hectares), 2011



Average rent per hectare (in nominal terms) has stayed relatively stable over the last number of years (see Table 3.6). The average rent paid in 1996 was €230.24 per hectare while by 2011 this had only risen to €241.10 per hectare in nominal terms. On land with good soil, nominal average rent per hectare decreased steadily from 1996 to 2005, falling from €280.82/ha to €253.96/ha. However, nominal rents then started to rise again and stood at €279.15/ha in 2011. Nominal rents on land with medium quality soil stayed constant at just over €200/ha over the time period between 1996 and 2011. Nominal rents on land with poor quality soil rose steadily from 1997 onwards, peaking at €179.52 in 2007 but have since slipped to €154.62/ha in 2011.

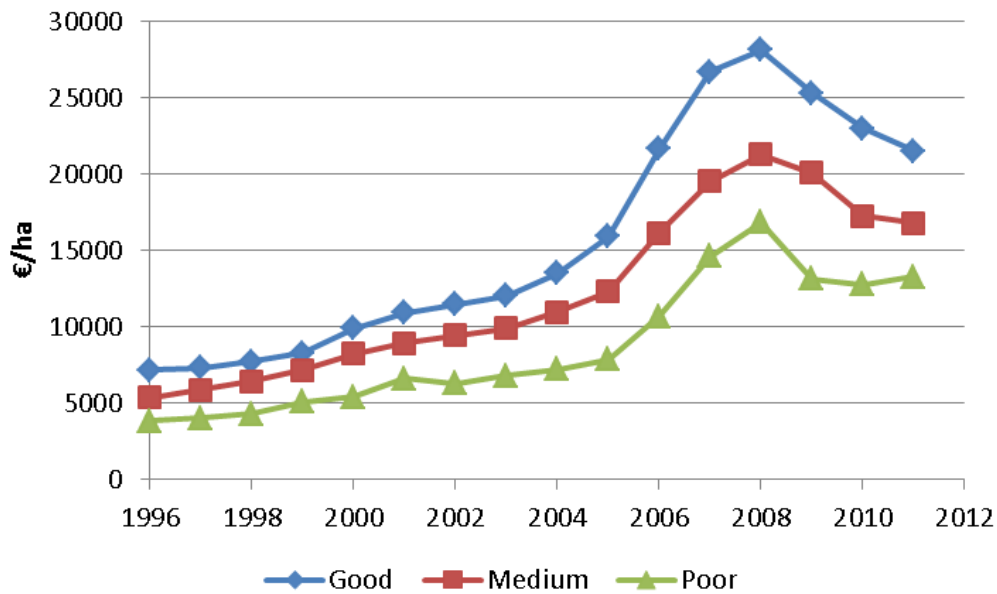
Table 3.6 Average Rent per Hectare by Soil Type (in €/ha), 1996-2011

Year	1996	2011
Soil		
Good	€280.82	€279.15
Medium	€203.52	€213.91
Poor	€136.96	€154.62
Total	€230.24	€241.10

The amount of agricultural land sold in Ireland each year is very small, accounting for less than 1% of Irish farmland (Busteed, 2014). Supply of land for sale is inhibited by the traditional model of agricultural land mobility where land is inherited rather than sold. Agricultural land values are shown in Figure 3.3. These values are based on NFS data which are self-reported estimates of the value of farmland in the dataset. Values rose through the 1990's and most of the 2000's as Ireland experienced rapid economic

growth and the development of a property bubble. As demand for residential and commercial land increased, agricultural land values also spiked as purchasers hoped to have the land rezoned for alternative uses. The disconnect between stable land rental prices and increasing agricultural land values shows that the increase in land values was not due to agricultural factors. As Figure 3.3 shows, values peaked in 2008 and fell rapidly afterwards as the property bubble collapsed and recession took hold.

Figure 3.3 Average Self-Reported Agricultural Land Values by Soil Type (in €/ha), 1995-2012



There are a very small number of land transactions in the NFS (c.20 sales and c.20 purchases per year). The average land purchase between 1996 and 2011 in the NFS was 8 hectares at €16514/ha. The average land sale between 1996 and 2011 was 4.7 hectares at €120151/ha. Table 3.7 shows the average amount of land purchased and sold per transaction in the NFS, as well as the average nominal price per hectare from 1996 to 2011. As Table 3.7 shows, average land sale prices are much higher than land purchase prices. In Ireland, farmers sometimes sell small pieces of land, often to family members, for the building of one-off housing. The rezoning of land for residential or commercial use also increased during these years, further increasing land sale prices.

Table 3.7 Purchases and Sales of Agricultural Land (in hectares and €/ha), 1995-2012

<i>Year</i>	<i>Average Hectares Purchased</i>	<i>Average €/Ha</i>	<i>Total Share of Land Purchased</i>	<i>Average Hectares Sold</i>	<i>Average €/Ha</i>	<i>Total Share of Land Sold</i>
1995 – 1997	6.97	7582.17	0.35%	6.56	36453.43	0.25%
1998 – 2000	7.89	8963.62	0.24%	2.66	82223.92	0.15%
2001 – 2003	6.50	19082.31	0.20%	4.44	103781.50	0.18%
2004 – 2006	11.36	20767.09	0.31%	3.71	166894.50	0.19%
2007 – 2009	7.55	35506.64	0.13%	6.34	192883.8	0.25%
2010 – 2012	9.39	21776.25	0.22%	21.99	79799.58	0.14%
Total	8.04	16162.05	0.24%	4.92	114039.50	0.19%

3.5 RESULTS II: SOCIO-ECONOMIC DRIVERS OF LAND ACCESS

Dairy farming represents the second biggest share of agricultural land in Ireland but it remains far behind that of cattle farming (see Figure 3.4). However, since public policy targets such as FH2020 envisage an expansion of dairy production, it may be necessary to increase the amount of land dairy farmers can access. Table 3.8 shows that there is already a pre-existing share of land on dairy farms that is either spare dairy platform or is being used for non-dairy purposes. Spare dairy platform refers to land on dairy farms that is within walking distance of the milking parlour and is not currently being used by the dairy herd for any other farming purpose. The land on dairy farms currently being used for non-dairy purposes corresponds to 11.9% of all agricultural land (44.4% of land on dairy farms), while spare dairy platform corresponds to 2.9% of all land (11% of land on dairy farms). Therefore, there is quite significant land within dairy farms currently being used for other purposes, which will be the easiest on which to expand.

Figure 3.4 Land Use on Irish Farms by Soil Type (in hectares), 2011

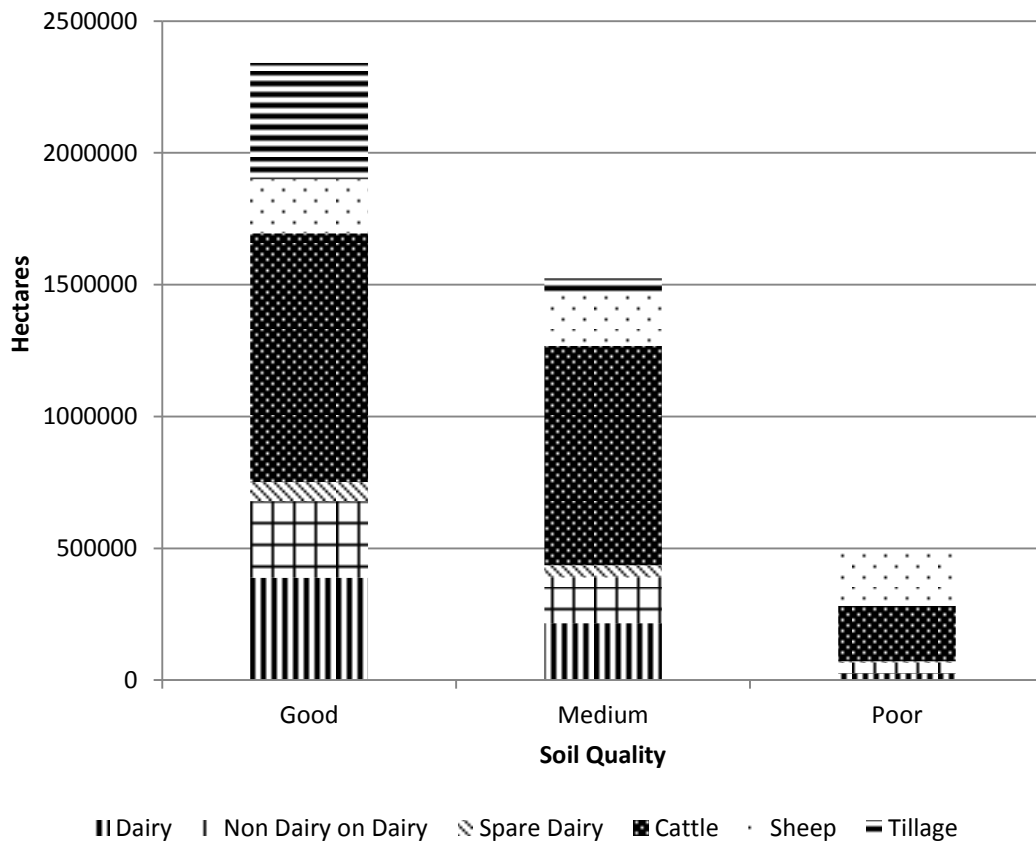


Table 3.8 Land Use Share on Irish Farms by Soil Type, 2011

Farm System	Dairy	Non-Dairy on Dairy	Spare Dairy	Cattle	Sheep	Tillage
Soil						
Good	17.1%	12.8%	3.2%	41.6%	9.1%	19.4%
Medium	14.6%	11.7%	3.1%	56.1%	13.9%	3.4%
Poor	5.4%	8.1%	1.3%	43.4%	43.1%	0.0%
Total	14.9%	11.9%	2.9%	46.9%	14.6%	11.6%

Milk Expansion Scenarios

We now look at the likelihood of achieving the target of a 50% milk production increase by 2020. Table 3.9 presents a number of potential scenarios in how milk production can be increased given the current land use and milk yield structure. This gives an insight into how much land will be required to reach the target of increasing milk production by 50%. Given that the baseline milk production on which the target is based is an average of production from 2008 to 2010, a 50% increase amounts to a milk production target of 7.4 billion litres by 2020. This target can be met in four ways: increasing yield; increasing stocking rate; increasing available land area or a combination of the three.

Table 3.10 shows to what extent the FH2020 target is achievable with only yield and/or stocking rate increasing and no extra land becoming available.

Four yield and stocking rate levels are modelled. The yield scenarios are based on the long-term trend of milk yields since the introduction of quota in 1984 (see Table 3.9). From 1984 to 2010, there has been an average yearly increase of 1.3% in milk yields per cow based on CSO data. The first yield scenario has yield per cow remaining constant at 2010 levels of 5,000 litres per cow. The second scenario has yield per cow increasing yearly at half the long-term rate (0.65%) up to 2020. The third scenario has yield continuing to increase yearly at the long-term rate (1.3%) while the fourth scenario has yield increasing yearly at 50% above the long-term rate (1.95%) up to 2020. The four stocking rates that are modelled are 1.8 LU/ha (the average stocking rate of dairy farms in 2010), 2 LU/ha, 2.5 LU/ha and 3 LU/ha.

Table 3.9 Description of Yield Scenarios

<i>Yield</i>	<i>Description</i>
No Increase	Yield per cow stays constant at 2010 levels (5,000l/cow)
50% Long-Term Rate	Yield per cow increases at 50% of long-term rate (0.65%)
Long-Term Rate	Yield per cow increases at long-term rate (1.3%)
150% Long-Term Rate	Yield per cow increases at 150% of long-term rate (1.95%)

The results show that without a large increase in stocking rate, extra land will be required to meet the FH2020 milk production target (see Table 3.11). This replicates results from Laple & Hennessy (2012) who found it unlikely that the FH2020 target would be achieved given the current land base of Irish dairy farmers. At both the current stocking rate of 1.8 LU/ha and the increased rate of 2 LU/ha, none of the modelled yield rates produces enough milk to reach the target of 7.4 billion litres. When the stocking rate is raised to 2.5 LU/ha, yield growth is still required although growth at 50% of the long-term rate is sufficient to reach the target. When the stocking rate is set at 3 LU/ha, the Food Harvest target is achieved, even without any increase in yield over 2010 levels.

**Table 3.10 Milk Production Required to Reach Food Harvest 2020 Target
(000,000's litres)**

	<i>Stocking Rate</i>			
	1.8 LU/ha	2 LU/ha	2.5 LU/ha	3 LU/ha
Yield Increase	5007.8	5564.3	6955.3	8346.4
No Increase	5343	5936.7	7420.9	8905.1
50% Long-Term Rate	5698.3	6331.4	7914.3	9497.2
Long-Term Rate	6074.6	6749.6	8437.1	10124.5
150% Long-Term Rate				

Table 3.11 Distance from Food Harvest 2020 Target

	<i>Stocking Rate</i>			
	1.8 LU/ha	2 LU/ha	2.5 LU/ha	3 LU/ha
Yield Increase	-32%	-25%	-6%	+13%
No Increase	-28%	-20%	0%	+20%
50% Long-Term Rate	-23%	-14%	+7%	+28%
Long-Term Rate	-18%	-9%	+14%	+37%
150% Long-Term Rate				

In reality, reaching the FH2020 target only through increased yield and/or stocking rate is unrealistic. Although Irish dairy farmers are constantly improving efficiency in terms of increased grazing through grassland management, increased stocking rates usually have the effect of slowing per cow yield growth or even causing yields per cow to fall (Baudracco et al., 2010; MacDonald et al., 2008). Additionally, increased stocking rates may conflict with the European Union Nitrates Directive. The Nitrates Directive aims to address water pollution by nitrates from agriculture by capping the amount of livestock manure that can be applied to land at 170kg of nitrogen per hectare. This has the effect of limiting the stocking rate a farmer can maintain on their farm. Currently, Ireland has a derogation that allows a 250kg nitrogen limit but this derogation runs out in 2017. There is no guarantee that such derogations will be available again after 2017, which poses a risk to expanding dairy farmers who aim to maintain high stocking rates going forward. Given these difficulties around yield and stocking rates, it seems likely that extra land will be required to reach the FH2020 target.

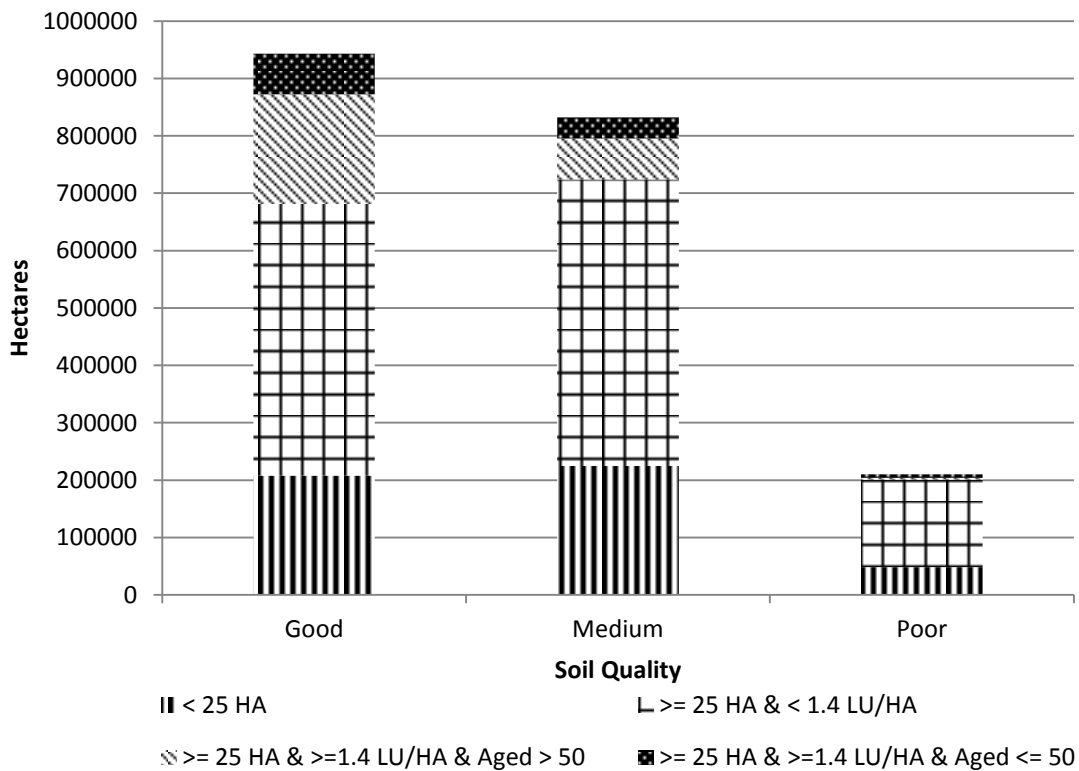
Socio-Economic Scenarios by Land Use Type

Accessing extra land for dairy farming would require structural change in Irish agriculture. This could occur through existing dairy farmers acquiring land via land markets or collaborative farming arrangements or through current land owners becoming new entrant dairy farmers. Given, the static nature of the Irish land market, as well as the low uptake of collaborative farming arrangements in Ireland, current land owners becoming new entrant dairy farmers seems the most likely future scenario.

Looking at current land use, 19.4% all agricultural land with good quality soil is used for tillage farming. While these farms have sufficient quality land and are generally large in size, they are unlikely to have facilities for handling dairy animals and have limited experience in managing animals. They would thus require quite significant investment and re-skilling and/or change of management to move into dairy farming. In terms of land with good and medium soils, 11% of this land is used by sheep enterprises, which again are likely to face issues in terms of investment, in addition to specific dairy management skills.

Of the alternative farming systems, cattle managing systems are the most complementary for moving into dairy. Nearly half of the land on farms with good or medium soils is used for cattle farming. However, of these farms, 24% have farms with less than 25 hectares and would thus require consolidation before moving into dairy. Of the remainder, 55% of cattle farms on good or medium soils are larger than 25 hectares and have stocking rates of less than 1.4 LU/ha. The stocking rate is low largely due to either age (31% aged 65+) or due to other work commitments (33% with an off-farm job). Those most likely therefore to consider moving into dairy are those with stocking rates of 1.4 LU/ha or higher and a farm of at least 25 hectares, which amount to 21% of cattle farmland in the good/medium soil range and to 10% of all farmland with these soils. Of the farmers with the necessary land and stocking rate, 25% have off-farm employment. Age is also likely to be an issue with 19% over 65 in 2011, and only 29% 50 years of age or younger.

Figure 3.5 Land Structure in Cattle Farms (in hectares), 2011



Thus although there is quite a lot of land that could be utilised for dairy expansion, even before one considers issues such as skills, access to capital and the fractured nature of agricultural plots, there are a number of issues associated with potential structural change. One of the critical issues will be the decoupling of ownership and production. A significant amount of land that could be used for dairy expansion exists, but given the current demographic and land structures, such expansion may prove difficult to achieve.

3.6 CONCLUSIONS

The agricultural land market in Ireland is characterised by stasis. Cattle farming is the dominant use of farmland, with over half of the total agricultural land in the country being devoted to it. Movement of land from one farming system to another is rare. Farm sizes have increased somewhat, with farms over 50 hectares gaining land at the expense of small farms (those under 25 hectares). This is an important development (for farm viability) given the increase in the price of inputs, as farms need to scale up to spread fixed costs over a bigger land area. However, 34% of total land is still held in cattle

farms of less than 50 hectares, a situation that may be difficult to sustain given the lack of market profitability in the cattle farming sector (Hennessy et al., 2013).

The share of farmland that is rented in rather than owned has increased to over 17% of all agricultural land but this figure still rests well below the European average. This increase in land rented in by farmers is not matched by the amount of land farmers are renting out (1.8% of total UAA), suggesting that farmers are renting land from non-farmers rather than from other farmers. Nominal rent prices have remained stable over time, regardless of the quality of the land. Agricultural land values underwent a boom in concert with residential and commercial property prices from the late 1990's until the economic crash of 2008 caused prices to fall precipitously. The disconnect between agricultural rents and farmland values implies that the spike in land prices was not caused by agricultural factors. A very small amount of farmland is bought and sold each year, a pattern that predates the rise in agricultural land values during the economic boom (Commission for the European Communities, 1982; Kelly, 1983; Roche & McQuinn, 2001). Much of the land sold is of a very small size (less than one hectare), with these plots of land likely used to build one-off houses.

One consequence of this lack of land mobility is that it makes it difficult for those wishing to enter farming to acquire land. This is especially the case for young, aspiring farmers who are unlikely to have the financial means to compete for land even if it does become available. Despite the fact that farmers are becoming older on average (Hennessy et al., 2013), a renewed interest in farming amongst young people in Ireland is currently being observed. Enrolments in agricultural colleges have doubled between 2007 and 2014, with nearly 1,500 applications for Green Cert courses (the benchmark agricultural qualification in Ireland) (Healy, 2014). This is estimated to be three times the normal level of applications (Teagasc, 2015). This suggests that there is demand to enter the farming profession in Ireland. However, the increasing age profile of farmers suggests these prospective farmers are unable to access land. This is a Europe-wide trend where the greatest need reported by young farmers is the rental or purchase of land (Zondag et al., 2015). The inability to access land is particularly problematic in terms of dairy expansion as Irish dairy farmers tend to be younger on average than farmers in other systems (Hennessey & Moran, 2015).

In terms of dairy expansion, there is a not insignificant amount of land that dairy farmers can immediately expand onto following the removal of quota restrictions. This land consists of land on dairy farms currently used for non-dairy farming purposes. In total, this land corresponds to nearly 14% of the agricultural land in the country. Given the increased stocking rates and/or increased per cow milk yield that would be necessary to reach FH2020 targets, it is almost certain that additional land will be required in the future by dairy farmers. This corresponds with the findings of Laple & Hennessy (2012) who found that achieving the FH2020 target of a 50% increase in milk output on current dairy farms' land base is unlikely. Cattle farmers are likely to be in the best position in terms of skills and land quality to transfer to dairy farming but multiple hurdles may prevent this from happening. Small farm size, low stocking rates and age-related concerns mean that in actuality, only a small number of cattle farmers may be likely to switch to dairy farming. Taking farm size, stocking rate and age into account, just over 100,000 hectares of cattle land may come into dairy usage through cattle farms switching system, corresponding to 2.5% of total agricultural land.

The environmental effect of increasing dairy production must also be considered. Ireland has international obligations in terms of greenhouse gas (GHG) emissions reduction and water quality maintenance through the Nitrates Directive. Dillon et al. (2016) report that although the economically top-performing dairy farms emit less GHG emissions than their less intensive counterparts, the same top performing farms have a higher nitrogen surplus per hectare on average. Given that the most economically productive farmers are also the most intensive and therefore the most likely to expand following quota removal, achieving environmentally sustainable dairy production may prove difficult.

While immediate and significant dairy expansion following quota removal seems feasible given current land structures, medium and long-term growth in milk production will require more land to become available than currently seems likely. In order to achieve policy targets, increased land mobility will have to be facilitated. The low levels of renting and thin transaction market show a bias amongst Irish farmers toward owning the land that they farm. However, relatively little is known about the attitudes of Irish farmers to land mobility.

Greater understanding of what drives the decisions of Irish farmers is required to inform future government policy, especially as numerous policy changes have already been made in order to encourage land mobility and to accommodate new entrants to the farming profession. Measures such as stamp duty exemptions for young farmers acquiring land, income tax exemptions for land owners leasing out land long-term and allowing for farm partnerships between family members have failed to have the desired effect in terms of making agricultural land more mobile. However, despite increased government interest in the area, Irish land markets are the least regulated in the EU (Swinnen et al., 2014). It must also be noted that policies leading to effective changes in tenure systems are very politically sensitive and difficult to achieve (Swinnen et al., 2016). Further work is needed to identify new policy options that can make land mobility more attractive to farmers.

Chapter 4. HYPOTHETICAL MICROSIMULATION MODELING – FARM TAXATION

In this chapter, the development of a farm microsimulation model is described. The model abstracts from population and behavioural complexity, focusing primarily on the dimension of policy complexity. This chapter specifically considers the nature of taxation policy and household income-related cash transfers as these policies apply to farms. The behavioural drivers of different farm level decisions are considered, including land access and release, animal stocking rate decisions, intergenerational decisions such as succession and inheritance, and farm investment decisions. This model is classified as a hypothetical microsimulation model (Burlacu et al., 2014), of the type used in the International Farm Comparison Network (IFCN) (Hemme et al., 2000). It focuses on stylised farm households, considering the change in the budget set or disposable income depending upon a decision in a specific dimension for a particular farm type. The chapter also considers the impact of recent Irish Agri-Taxation policy.

4.1 INTRODUCTION

While much of the farm level modeling literature focuses on farm subsidies (Ahearn et al., 1985; Bhaskar & Beghin, 2009; Keeney, 2000; Sckokai & Moro, 2009), tax incentives can be quite important in relation to farm level decision making. Farm taxation can also influence decisions in relation to capital investment, land mobility and organisational decisions (Andersen et al., 2002; Hill & Cahill, 2007).

There are a number of strands to the agricultural taxation literature. Much of it is historic, reflecting the relative importance at that time for the sector as in the case of Venn (1928) and Evans (1969). Reflecting the relative importance of agriculture in developing countries, a significant proportion of the literature focuses on the incidence of taxation in such countries (D'Silva & El Badawi, 1988; Hamid, 1973; Khan, 2001; Raj, 1973; Sah & Stiglitz, 1987; Skinner, 1991a; Winter-Nelson, 1997).

Some papers focus on theoretical questions such as the efficiency of land taxation (Skinner, 1991b), land reforms (Sazama & Davis, 1973) or the impact of decoupling with distortionary taxation (Moschini & Sckokai, 1994). Ahmad and Stern (1991) consider issues around the optimal taxation of agriculture and land.

While some of the literature focuses on macroeconomic impacts, (Krueger et al., 1988), the focus of this research is on micro-level incentives for farm production decisions, drawing primarily on research in middle income countries (Xu et al., 2012; Zhong et al., 2012). While some of the literature focuses on incentives in relation to environmental incentives (Berntsen et al., 2003; Casamatta et al., 2011; Daugbjerg, 1998; Van Kooten et al., 1995), this chapter focuses on productivity related activities (Lewis et al., 1988).

In particular, this chapter focuses on an OECD country, Ireland, where agriculture is relatively important and where agricultural taxation has been the subject of a recent national review (Department of Agriculture, Food and the Marine, 2014). This review studied and critiqued the suite of tax based support measures that have been developed over time in an ad-hoc manner. The report focused on a number of measures that would facilitate an improvement in the productive capacity of Irish agriculture, namely increasing land mobility, facilitating succession and inheritance, the incentivisation of productive activity such as investment, and improving environmental sustainability. The report makes a number of recommended changes to the agri-tax code based upon a cost benefit analysis.

This chapter considers at a micro-level the incentive structure of the tax supports within Irish agriculture and the recommended policy changes of the Agri-Taxation Review. As in the case of other small or medium sized enterprises, modeling taxation poses a challenge in relation to data needs at a micro level (Buslei et al., 2014). Household surveys typically only incorporate aggregate self-employment income, while farm surveys incorporate detailed farm expenditure but may contain the wrong tax unit. Given the desirability of understanding the behavioural drivers of tax incentives, this chapter develops a hypothetical microsimulation model of agricultural taxation, utilising a framework similar to that used in benchmarking studies such as the International Farm Comparison Network (IFCN) (Hemme et al., 2000). While there are firm-level taxation microsimulation models (Bardazzi et al., 2016; Fossen & Bach 2008), this model is to our knowledge the first *ex-ante* taxation microsimulation for farm businesses.

The rest of the chapter is laid out as follows. Section 4.2 describes the policy context, detailing the structure of Irish agriculture, the Irish tax code and specific references to the agricultural sector. Section 4.3 outlines the research methodology, specifically microsimulation, as well as the hypothetical data that is used. Section 4.4 describes the

data in terms of the tax regimes and stylised farms used in the modelling process. Section 4.5 describes the results for different components of the tax regime while Section 4.6 provides conclusions and policy recommendations.

4.2 POLICY FRAMEWORK

The Irish Agricultural Sector

Cattle farming is currently the dominant form of agriculture in Ireland, accounting for 57% of land (Geoghegan & O'Donoghue, 2014). Dairy farming accounts for 14.9% of agricultural land, with sheep farming taking place on 12.3% of land. Tillage farming is undertaken on 8.6% of agricultural area. Cattle farming utilises the largest share of good quality soil (54.5%), followed by dairy farming (17.1%) and tillage (14.8%). As would be expected, almost all tillage farming takes place on good quality soil. Cattle farming also dominates the use of medium quality soil (64.1%), with dairy farming taking up 14.6% and sheep farming 10.8%. Poor quality soil comprises 11.4% of agricultural land with cattle (46.8%) and sheep (32.4%) farming being undertaken on the vast majority of this type of land.

Although these shares of agricultural land by farm system have remained largely similar in recent times, it is expected that this situation will change following the removal of dairy quotas and demand for land for dairy purposes increases (Dillon et al., 2008). Since dairy farming in Ireland uses an outdoor, grass-based feeding system rather than an indoor, feed-based one, good quality pastoral land is a key requirement for Irish dairy farmers (O'Donnell et al., 2008). Land also needs to be close to the milking facilities to enable cows to be close at hand for regular milking. Additionally, due to the infrastructure required by dairy farmers, land either needs to be owned or available on a long-term basis, in order for infrastructural investments to yield a return.

The land requirements for cattle and sheep farms are not as specific as those for dairy. Land quality is of lesser importance, especially for sheep farms, which tend to be quite extensive. Infrastructural requirements are less onerous compared with dairy farms, so land can be rented without investment being required to upgrade it, enabling shorter rental periods. Additionally, animals on cattle and sheep farms do not have to be moved as often as on dairy farms, so keeping animals on fragmented land parcels is less of an issue for these farmers. Tillage farms, the other main farm system in Ireland, also

require good land and infrastructural investment (often in the form of equipment) but the time and capital investment required to shift from pasture to tillage (and *vice versa*) means that land often stays in either livestock or tillage.

Agricultural land can be accessed or released in many ways. Firstly, it can be permanently transferred through purchase, sale or inheritance/gift. Secondly, it can be temporarily transferred by way of rent or lease. Thirdly, land can be shared through cooperative or partnership arrangements. Finally, land use can be changed, whether from one farm system to another (e.g. cattle farming to dairy farming), through the planting of crops or forests, or through the re-zoning of land from agricultural to commercial or residential use.

In an Irish context, permanent transfers of land comprise a relatively small part of the overall land market. Farms are mainly owner operated, with a strong desire amongst farmers for land to remain within their family when they retire or die (Donnellan et al., 2008). As a result, farmers can generally only access land through the rental market. However, the Irish rental market is limited in many ways. The main rental channel is through the conacre system where land is only rented for 11 months at a time. Long-term leases (leases longer than five years) are used less often by farmers, despite generous tax incentives to encourage their adoption. Farmers have difficulty accessing land and even when land can be accessed, they can rarely secure it for a long period of time.

Structure of the Irish Taxation System

This chapter focuses on taxation instruments that affect a number of different land transactions. These include:

- Income Taxation
- Social Insurance (PRSI)
- The Universal Social Charge
- Capital Gains Taxation
- Capital Acquisitions Tax
- Stamp Duty

In Ireland, there are three capital taxes that apply to farm transfer. They are Capital Gains Tax (CGT), Capital Acquisitions Tax (CAT) and Stamp Duty. CGT applies only to the farmer transferring land legally and it is charged at 33% of the value of the property gained between date of acquisition and date of sale/transfer. CAT is applicable to the person acquiring land and is charged at 33% of the value of the property acquired over and above the relevant relief threshold bands. Like CGT, CAT reliefs are available up to certain asset value thresholds and these reliefs are dependent on the relationship between the farmer and the new owner (i.e. son, daughter, niece, nephew etc.). In recent years, these thresholds have decreased dramatically (see annex at end of chapter) leading to a disincentive to take on farm land and assets in some cases. However, 2015 marked the first year since 2009 that these limits were increased.

Stamp duty is also applicable to the new owner and is charged at 2% of the value of the property, but can be reduced to 1% based on the relationship of the farmer to the new owner. If the new owner of the land is a son/daughter of the farmer, and is under the age of 35, with a minimum level 6 agricultural certificate, stamp duty is reduced to zero. Other policy incentives to facilitate earlier transfer in the Irish case include the young farmer top-ups on payments from the Basic Payments Scheme (BPS) and other direct payments. Farmers under the age of 40 who have a minimum level 6 agricultural certificate may receive a 25% top-up on their BPS payment (maximum limit of 50 hectares).

In order to model the impact on disposable income of changes at farm level, a number of transfer instruments are incorporated into the model including:

- State Pensions
- Family Income Supplement
- Less Favoured Areas/Areas of Natural Constraints Payment.

Instruments Specifically Targeted at the Agricultural Sector

There are a number of farm specific instruments within the tax-benefit code in Ireland. These include the following specifications.

- Low income farmers can receive a means-tested benefit called Farm Assist.
- Farmers receive a range of agricultural direct payments.
- Farmers pay self-employed PRSI.

- Some farmers get full or partial tax relief from increase in stock values.
- Farmers can reduce tax liabilities via the use of allowances for capital investments on, for example, land improvements or buildings and machinery.
- There are farm reliefs on capital taxes such as Stamp Duty, Capital Gains Tax and Capital Acquisition Tax.

The Agri Taxation Review

The Agri-Taxation Review was undertaken in 2014 by consultants on behalf of the Department of Finance and the Department of Agriculture, Food and the Marine. The specific objective of the review was to evaluate existing policy and to propose reforms in relation to tax reliefs, with the following policy objectives.¹

- **Increase the mobility and the productive use of land:** Access to land and the low level of land mobility is one of the main challenges facing farmers who want to increase their productivity. There is a growing consensus that the actual use of land is becoming more of an issue than ownership. While there is an existing rental market, the majority of these cases are for short-term conacre lettings. Long-term leasing has a number of advantages over the conacre system and the Review recommends measures to assist in rebalancing the market in its favour.
- **Assist succession:** The age profile of Irish farmers is increasing and it is recognised that there are many social and economic reasons why succession management is a challenge for farmers. Assisting succession and the transfer of farms has been a central part of agri-taxation policy and the Review includes a number of recommendations to maintain and strengthen that support.
- **Complement wider agriculture policies and schemes:** This includes supporting (a) investment to enhance competitiveness, including assisting new entrant, young trained farmers; (b) environmental sustainability, including the improvement of farm efficiency; (c) alternative farming models such as farm partnerships; (d) responses to increasing income volatility.

¹ <https://www.agriculture.gov.ie/agri-foodindustry/agri-foodandtheeconomy/agri-foodbusiness/agri-taxation/>, accessed May 24th, 2016.

The Budget for 2015 implemented many of the Review recommendations as follows.

- To increase access to land, and the more productive use of land, Budget 2015 includes a comprehensive package of five new measures:
 - Increase the income thresholds for relief from leasing income by 50%;
 - Introduce a fourth threshold for lease periods of 15 or more years;
 - Remove the lower age threshold of 40 years of age for eligibility;
 - Allow non-connected limited companies as an eligible lessee;
 - Relieve Stamp Duty on long-term leases (five years or more) for agricultural land.
- To assist succession and the transfer of farms, Budget 2015 includes four new measures:
 - A targeting of Agricultural Relief from Capital Acquisitions Tax to qualified or full-time farmers or to those who lease land out on a long-term basis;
 - For transfers under Retirement Relief, extension of the eligible letting period of a qualifying asset to 25 years;
 - For transfers other than to a child under Retirement Relief, as a once-off measure until the end of 2016, allow conacre lettings as eligible;
 - The extension of Stamp Duty Consanguinity Relief, i.e. relief to related persons, on non-residential transfers to the end of 2017.
- Taxation measures have a specific role to play in areas that are primarily supported through other policies, such as the CAP and to complement wider agriculture policies and schemes. There are three new measures:
 - Capital Gains Tax relief for farm restructuring now includes whole-farm replacement as eligible and the measure has been extended to the end of 2016;
 - In response to increasing income volatility, the income averaging measure has been enhanced by increasing the averaging period from three to five years;
 - The income averaging measure will also now allow averaging to be availed of where a farmer and/or their spouse are engaged in an on-farm diversification trade or profession.

- A range of measures have been retained, including:
 - To support investment to enhance competitiveness, including assisting new entrants and young trained farmers, the current Capital Allowances and current Stock Reliefs available to the sector are retained;
 - To assist environmental sustainability, profits or gains from the commercial occupation of woodlands remain tax exempt;
 - To assist succession and the transfer of farms, Agricultural Relief from Capital Acquisitions Tax, Retirement Relief from Capital Gains Tax and the current stamp duty exemptions on transfers of land are retained.

This chapter examines the effect that policy incentives have on the financial situation on farms and on the incentives associated with individual components of the tax regime.

4.3 METHODOLOGY

Due to the heterogeneous nature of farm households and the complexity of the policy instruments involved, it is difficult to understand the direct impact of tax and subsidy policy on farmer income and behaviour. The actual behaviour of farmers in terms of land mobility only informs us indirectly about the policy pressures on farmers due to the presence of numerous factors, both related and unrelated to the overarching policy structure affecting farmers' land mobility decisions. Therefore, in order to assess these policy pressures directly, a model that simulates policy at the farm level but that can also deal with the complexity of the policy instruments is required.

Microsimulation modelling is a micro-based simulation methodology that has the capacity to incorporate these elements (O'Donoghue, 2014). As a first model of its kind exploring the impact of farm level taxation, a hypothetical model is utilized. This model allows us to abstract from population complexity in looking at the complexity of relevant tax and subsidy policies, in order to provide illustrative examples of how these policies impact the financial return of farmers.

One of the primary advantages of hypothetical microsimulation models is their simplicity and relatively low data requirements. This adds to their understandability and also overcomes the problem of limited data availability. Another reason for utilising a

hypothetical model is that there are currently no representative data with sufficient detailed information to model farm income taxation. While farm surveys provide sufficient data at the farm level, they lack information on non-farm income sources and also do not cover the unit of analysis of the tax system. While household survey information is at a suitable level to model income taxation, the data is not precise enough to model farm income taxation.

Moreover, in the case of inter-generational transfers, the unit of analysis takes the form of multiple generations, while in the case of farm partnerships, the unit may incorporate multiple farm families. Both of these units of analysis are beyond the capacity of any existing dataset. A hypothetical modeling approach is employed to compare farm income for a number of hypothetical farms, in order to simulate how alternative tax and subsidy policies can impact farm level outcomes. It should be noted that while the hypothetical approach does not take into account the wide variation of farm and family circumstances (O'Donoghue & Sutherland, 1999), nor enable us cover for the wide heterogeneity of cases, it can provide interesting insights into the functioning of the system.

Microsimulation models use data on micro-units (e.g. individuals, households, firms, farms, etc.) to simulate the effect of policy or other socio-economic changes on the population of micro-units (Mitton et al., 2000). Microsimulation models act as *ex-ante* evaluation tools that generate synthetic micro-level data, which illustrate the counterfactual situations that would prevail under alternative scenarios, *ceteris paribus*. Hypothetical microsimulation models are often used in a different context than the traditional static or dynamic microsimulation models. Hypothetical models are an effective way of calculating and communicating the impact of policy and one can apply them in many situations relatively quickly.

Hypothetical models usually focus on a particular scenario under certain predefined assumptions, which allows us to examine the practical significance of hypothetical policy reforms. There is a medium-sized literature in the use of stylised farms for policy analysis. The majority of these, such as the International Farm Comparison Network, focus on production-related issues, simulating farm-level profits to compare farm systems across countries at a synthetic farm level (Hemme et al., 2000; Thorne & Fingleton, 2006). Like hypothetical microsimulation models used for tax-benefit

analysis, they can be used for comparative research where micro-data are not comparable. They are often used to compare the relative competitiveness of different farming systems such as dairy enterprises (Manjunatha et al., 2013; Thorne & Fingleton 2006) and oil seed crops (Prochorowicz & Rusielik, 2007). Hypothetical models can also be used for policy analysis (Doucha & Vaněk, 2006) and are well suited to farming systems where there is a paucity of micro-data such as in relation to organic farming (Zander et al., 2007).

This model extends the literature to incorporate the impact of farm taxation, building upon the literature relating to farm subsidies. Previous work includes McCormack et al. (2014), who used a hypothetical model to examine how subsidy policy created behavioural pressures amongst Irish beef farmers and Ryan et al. (2014) who developed a hypothetical forestry subsidies microsimulation model.

Burlacu et al. (2014) describe the contexts in which hypothetical models are used, i.e. for illustrative purposes, validation, cross-national comparisons, replacement of micro data and communication with the public. This model is a single country microsimulation model taking hypothetical farm units as the unit of analysis, with a policy scope of agricultural taxation and subsidies. Although the geographical scope is for a single country, Ireland, the framework is extendable to other countries, perhaps as an extension of the EUROMOD framework (see Sutherland & Figari, 2013) or for comparative purposes along the lines of the OECD Making Work Pay type analyses (Martin, 1996).

In terms of analytical scope, the model is utilised to evaluate existing policy and to provide *ex-ante* analysis of potential policy reforms. The model can be used to consider both budget constraint type analyses and inter-temporal analyses.

In terms of the budget constraint, as the primary agricultural systems considered are animal based, the stocking rate (or the number of animals per hectare) is employed as the unit of variation. However, in other analyses the unit of variation may include land for land mobility analyses (see Geoghegan et al., 2017a) or farm organisations, for example the simulation of partnership formation decisions (see Leonard et al., 2017).

Burlacu et al. (2014) identify the choices that are relevant for hypothetical models in terms of identifying the parameters that have been selected and the context of their

application (see Table 4.1). The model used in this chapter is characterised as a stand-alone model with a farm unit analysis, simulating over a relatively long period and is thus an inter-temporal model. The unit of variation used in this study is the impact of land use decisions on different farm systems. The analytical method used is net farm income.

Table 4.1 Choices for Hypothetical Models

<i>Interaction with another model</i>	<i>None – bespoke model used</i>
The unit of analysis	Farm unit
Period of analysis	Long-term
Unit of variation	Land use decision
Analytic measures	Relative net farm income

4.4 DATA

Farm Structure

In order to examine the range of Irish farm systems and farm incomes, representative farms of the main farm systems in Ireland are employed, i.e. dairy, cattle rearing and cattle finishing. Data from the Teagasc National Farm Survey (NFS) from 2009 to 2014 is used to build our hypothetical farms. Except where farm size is varied as part of the budget constraint, all farms have the average size for that system in a particular year. This is to prevent farm size effects from impacting on the net income results.

Table 4.2 contains the key parameters used in the model. All parameters are derived from the NFS (Hanrahan et al., 2014). The average family farm income (net income before taxes) per hectare differs across the farm systems since farm incomes differ greatly across systems as reflected, both in the stocking rate and the market output per livestock unit.

Table 4.2 Key Parameters Used in Model Scenarios

	2009	2010	2011	2012	2013	2014
Farm Size (Ha)						
Dairy	49.8	50.7	57.7	58.5	57.3	57.8
Cattle Rearing	29.6	33.9	32.8	37.1	40.4	40.6
Cattle Finishing	33.8	34.2	36.3	46.2	42.3	42.5
Stocking Rate (LU/ha)						
Dairy	1.87	1.80	1.86	1.85	1.95	1.98
Cattle Rearing	1.05	1.07	1.03	1.15	1.12	1.11
Cattle Finishing	1.25	1.22	1.24	1.28	1.40	1.40
Family Farm Income (€)						
Dairy	24085	44360	67928	48936	63217	67598
Cattle Rearing	5822	7229	10172	12105	9827	10369
Cattle Finishing	8877	9514	14536	18209	15475	13321
Subsidies (€)						
Dairy	21231	20626	22942	21843	21021	20916
Cattle Rearing	12981	13674	13574	15489	15425	14549
Cattle Finishing	15699	15120	16913	21197	18667	17747
Market Gross Output (€)						
Dairy	106553	131933	172670	170299	193449	190283
Cattle Rearing	23136	28801	30480	38836	39668	39894
Cattle Finishing	32288	34053	41986	57795	55991	50954
Direct Costs (€)						
Dairy	46744	47843	59516	71572	80279	72521
Cattle Rearing	8048	9854	9311	12829	14805	13908
Cattle Finishing	11515	11784	13306	20391	22166	19079
Overhead Costs (€)						
Dairy	35724	39729	45226	49790	49952	50164
Cattle Rearing	9267	11718	10998	13902	15036	15616
Cattle Finishing	11895	12754	14144	19196	18350	18555

Source: Teagasc National Farm Survey

We report also the decomposition of family farm income into market gross output, direct costs and overhead costs. Interestingly, subsidies are about 45% of family farm income for dairy, 160% for cattle rearing and 135% for cattle finishing, reflecting the fact that market income does not cover all the costs of cattle farming.

Farm Tax Regime

Farm income is taxed normally with a married farmer's income being subject to 20% tax up to €42,000 and 41% tax on all income over that amount. Lease income is exempt from income tax up to and including certain amounts, depending on the length of the lease agreement. Leases of five to six years are exempt from income tax up to and including the first €18,000 of lease income. Leases of seven to nine years are exempt up to the first €22,500, those of ten to fourteen years the first €30,000 and those of fifteen years are greater are exempt up to the first €40,000 of lease income. Any lease income exceeding these amounts is taxable at the marginal rate.

The tax rates and lease income exemptions used in the model are from 2015 and are listed in Table 4.3. PRSI is a form of social insurance for the self-employed, which the vast majority of farmers are, pay at a rate of 4% on gross income (including lease income). The Universal Social Charge (USC) is a tax paid on gross income (including lease income), starting at 1.5% on the first €12,012 of income, 3.5% on the next €5,564, 7% on the next €52,468 and 8% on the balance of income. An income tax credit of €3,300 for married individuals is also modelled. The income tax schedule and lease income exemptions apply as discussed earlier.

Table 4.3 Key Income Tax Parameters, 2015

<i>Item</i>	<i>2015</i>
Income Tax (Low Rate)	20%
Income Tax (High Rate)	41%
PRSI	4%
Universal Social Charge (USC)	1.5% – 8%
Married Income Tax Credit	€3,300
Leasing Income Tax Exemptions:	
5-6 year lease	First €18,000 exempt
7-9 year lease	First €22,500 exempt
10-14 year lease	First €30,000 exempt
15+ year lease	First €40,000 exempt

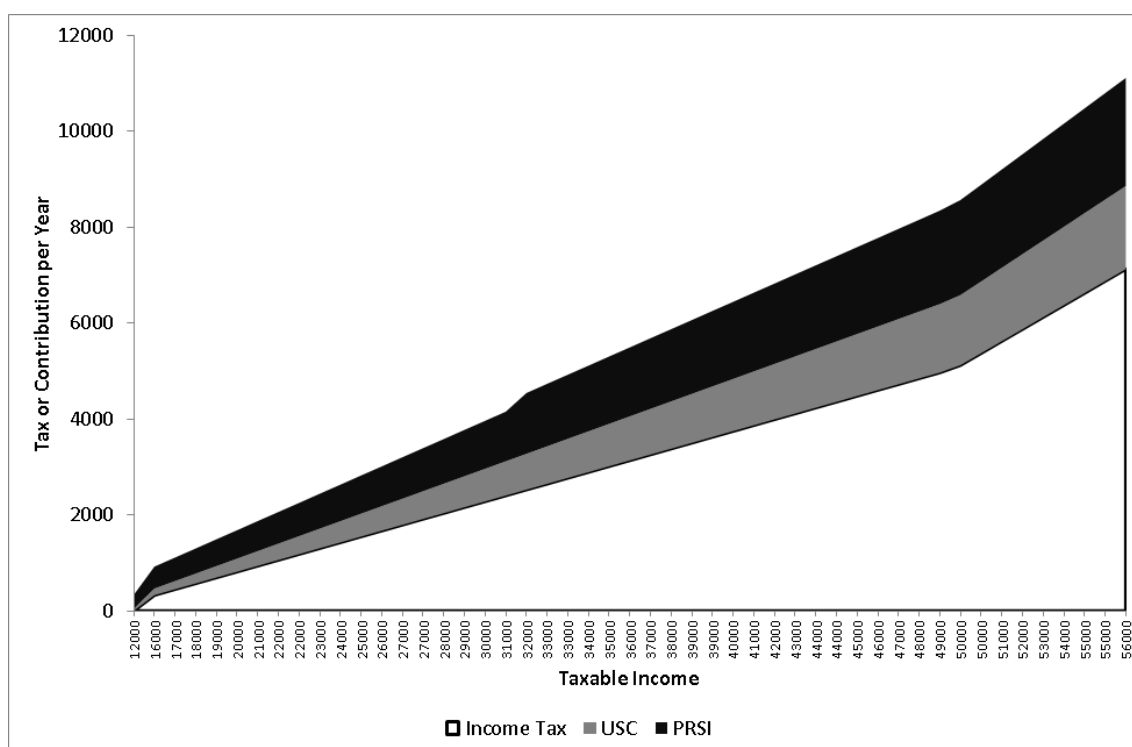
It is assumed that the farmer is married and less than 65 years of age for the entire period studied unless specified otherwise and that tax/exemption rates remain the same from 2015 onwards. All monetary amounts used in the chapter are nominal. A discount rate is not used since all comparisons made in the chapter are between future incomes generated over identical periods of time.

4.5 RESULTS

Income Taxation –Basic Structure

Figure 4.1 describes the general direct taxation and contribution schedule for a cattle farmer with average income, aged 62. Given an allowance of €5000, the farmer pays more self-employed PRSI initially at a flat rate of 4%. The USC increments upwards in bands from 0 to 10%, to €100,000. Direct Income Tax has two bands (20% and 41%) and has an optional joint system, but with less than full sharing of the standard rate band plus a number of tax credits. The combination of the allowances and variable rates gives the observed non-linear shape.

Figure 4.1 Direct Taxation Schedule



Income Taxation: Capital Allowances

Farmers, like other self-employed people and investors can deduct the depreciation associated with capital investment in their business. Different assets have different depreciation rates. For buildings completed in the last few years with capital allowances still available, the deduction rate is 15% of the after-grant cost for the first six years and 10% for the seventh year. For machinery purchased in the last few years with capital allowances still available, the deduction rate is 12.5% of the cost for eight years. In Figure 4.2, the deduction rates for a cattle rearing farmer in 2014 are reported. Because capital reliefs are deducted from taxable income, the implicit tax allowance is at the marginal rate. In a progressive tax system, with an increasing average tax rate as identified in Figure 4.2, increasing capital relief as a percentage of taxable income is observed. The relief is thus worth more for wealthier farmers, as farmers with lower incomes have less taxation and a lower effective tax rate over which to deduct their capital reliefs.

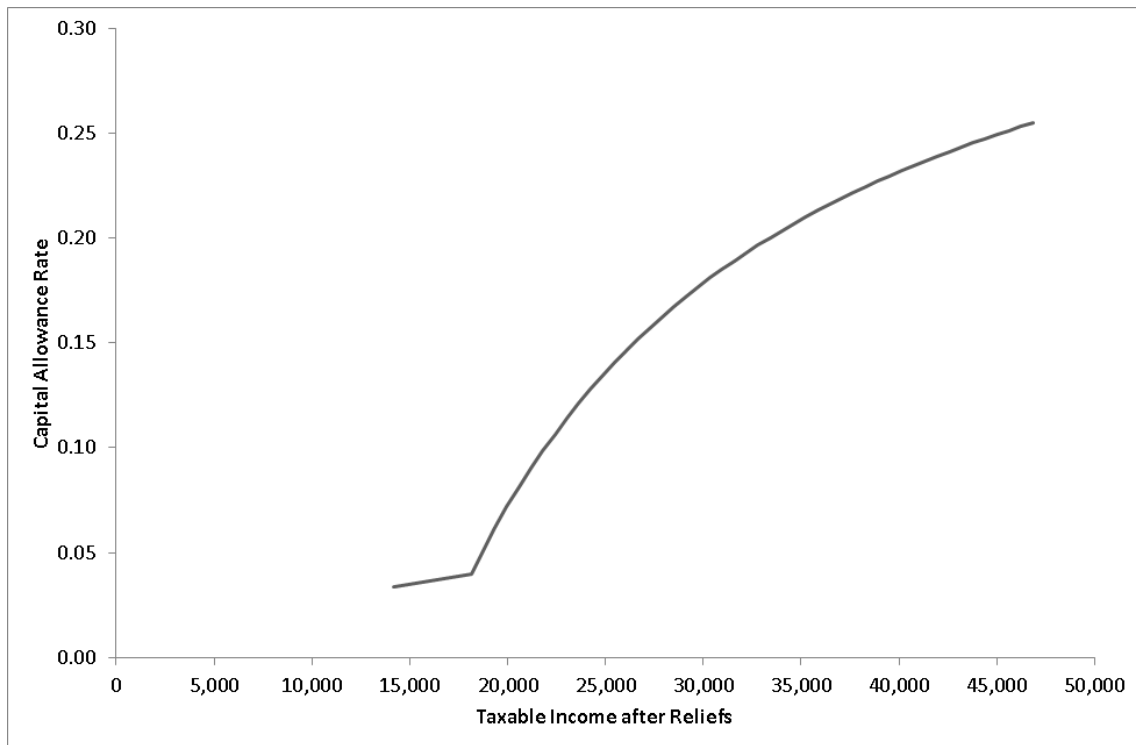
Income Taxation: Stock Relief

Milk quotas, which restricted total milk production to stay constant at 1984 levels (with a slight increase after the 2008 CAP Mid Term Review), were abolished in 2015. As a result, many dairy farmers increased their milk production, increasing both milk yield levels and the number of animals they carried. When farmers increase their stock value, they increase their tax liability for stock change. Farmers can deduct 25% of the increase in their stock value with the remainder being taxable.

In order to promote expansion by a number of different groups, the tax authorities have created a number of tax incentives using stock relief. Young farmers under the age of 35, with agricultural education (minimum level 6 agricultural certificate) can fully deduct their stock increase, so effectively have a stock relief rate of 100%, while farmers entering legal partnerships have stock relief of 50%.

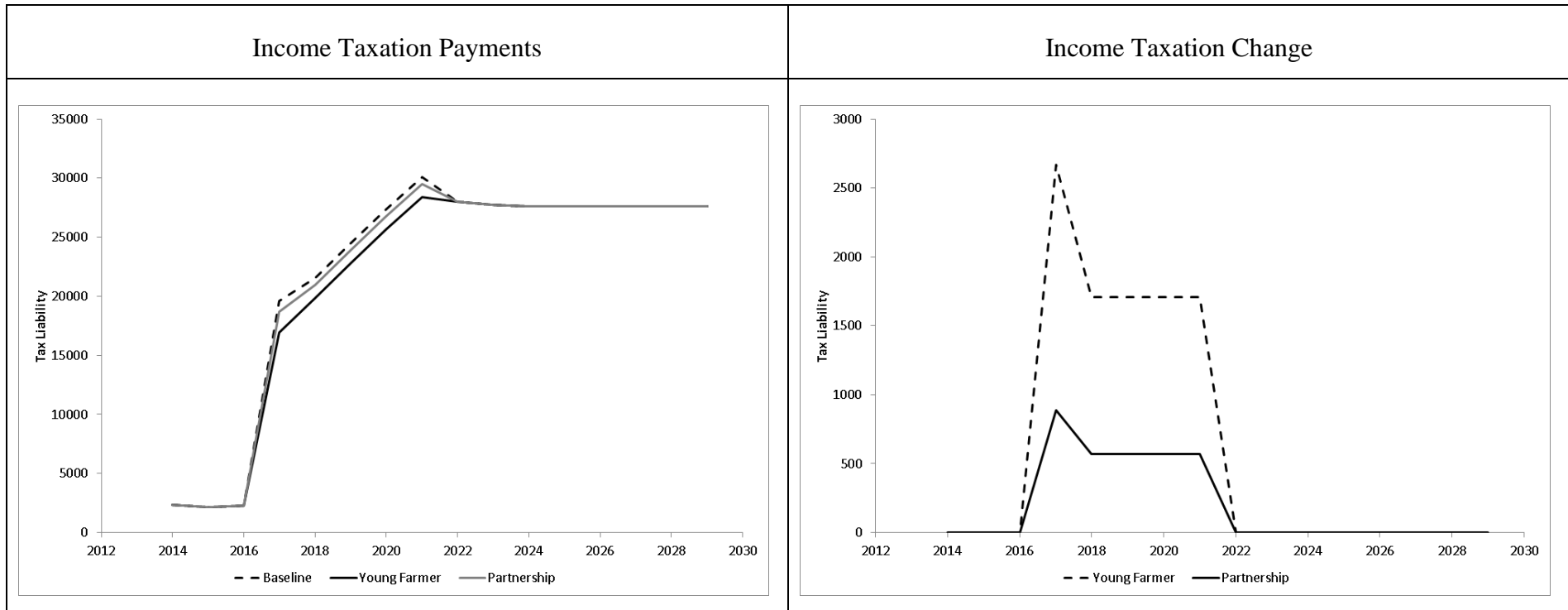
In Figure 4.3, the impact of these incentives is highlighted. The total tax payment of a farmer moving from cattle to dairy between 2016 and 2022 is described. The farmer moves from being an average beef farmer to be an average dairy farmer, increasing their stocking rate at a steady rate. Given the higher incomes of dairy farmers, the tax payments increase.

Figure 4.2 Capital Relief Rate



We note in Figure 4.3, that in the initial move from cattle rearing to dairy cattle, that the value of the relief is worth €890 for partnerships and over €2600 to young farmers, decreasing as the stocking rate rises to about €570 per annum for partnerships and about €1700 for young farmers.

Figure 4.3 Stock Relief for Dairy Expansion with Partnership and Young Farmer Scenarios



Income Taxation: Long Term Leasing

Most land is leased in Ireland on a short-term (less than one year) basis, known as conacre. This maximises flexibility and maintains eligibility for land-based subsidies. However, short-term land leases mean that lessees are unlikely to invest in land improvement initiatives such as roadways, fencing or water provision, or make major investments such as dairy milking parlours. In order to incentivise longer term leases, leases of five years or longer are exempt for tax purposes up to a particular threshold. However, anecdotal evidence indicates that the share of long term leases is relatively low, albeit increasing (Revenue, 2017).

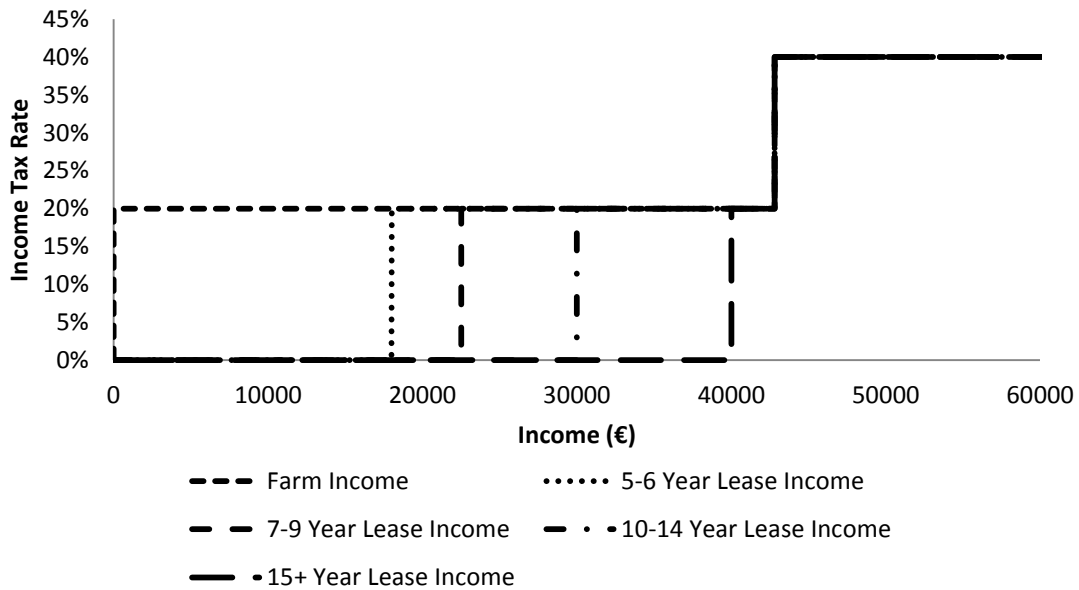
Table 4.4 Changes to the Land Lease Arrangement – Value of Tax Relief Threshold

	<i>Pre 2015</i>	<i>Post 2015</i>
5-6 Years	€12000	€18000
7-10 Years	€15000	€22500
10-15 Years	€20000	€30000
15+ Years	€20000	€40000

Table 4.4 refers to the structure of this instrument and describes the policy reform that was introduced after the Agri-Taxation review. The value of the potential tax relief increases with the length of the lease. After the Agri-Taxation review, the upper limits of tax relief were increased and a new threshold was introduced for leases of 15 years or more.

Figure 4.4 reports the associated tax schedule (with marginal rates) if a farmer leases out all their land. Leases of five to six years are exempt from income tax up to and including the first €18,000 of lease income. Leases of seven to nine years are exempt up to the first €22,500, those of ten to fourteen years are exempt for the first €30,000 and for leases of fifteen years and there is a greater exemption up to the first €40,000 of lease income. Any lease income exceeding these amounts is taxable at the marginal rate.

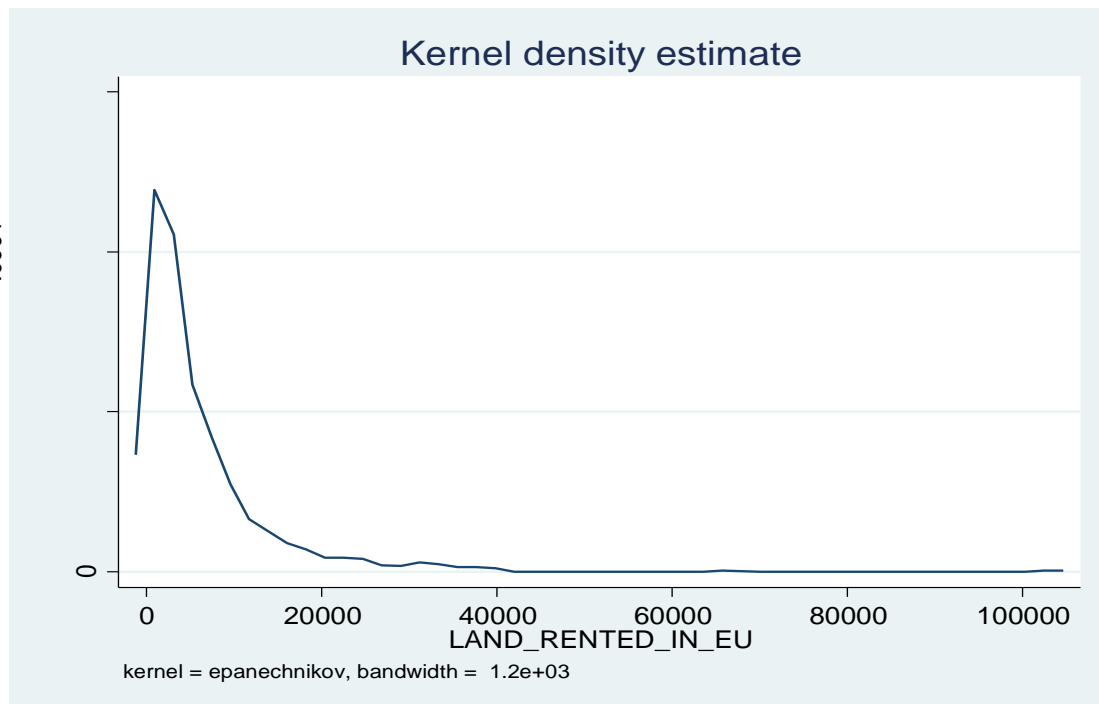
Figure 4.4 Income Tax Schedule for Farm and Lease Income in 2015



Long-term leasing also raises issues in relation to subsidy policy change. When subsidies accrue to the land user rather than the land owner, farmland owners may be reluctant to lease out land, as subsidy policy change within the term of the lease may deprive them of future subsidy payments. Such a situation occurred following the 2013 re-negotiation of the Common Agricultural Policy (CAP). Irish farmers who had leased out all their land were not considered to be ‘active’ farmers and were therefore not eligible for new entitlements under the new subsidy system (Geoghegan et al., 2017a).

Land is typically let at rates of €250-€350 per hectare (Geoghegan et al., 2017a). With average farm sizes of about 50 hectares and with land typically let in small parcels, the upper limits may not come to bear. In Figure 4.5, using data from the Teagasc NFS, the distribution of lease incomes on Irish farms is reported. As the vast majority of leases are less than the original five to six year lease limit of €12,000, increasing the value of the tax threshold in the reform has actually limited the potential benefit for most farms. It does not shift the cost-benefit implications for a farmer in relation to the length of the lease. It increases the return only for larger farms or farms with high potential rent, which is a relatively small market. It is likely therefore, that it would require more significant incentives to increase the share of long-term leases.

Figure 4.5 **Distribution of Lease incomes on Irish Farms**



Capital Taxation – Capital Acquisition Tax

Capital Acquisitions Tax (CAT) is paid by recipient farmers when land is transferred to them. This happens either at the point of inheritance or if a farm is transferred before death. Once certain exemptions apply, the asset transfer is taxed at a rate of 33%. In addition to a standard relief of €3000, sons or daughters have a lifetime relief of €225,000 before the CAT tax rate applies. For siblings and parents, the limit is €30,150 while others have a limit of €15,075.

There are significant reliefs available for farm successors. For individuals where the farm asset comprises 80% or higher of total assets (including the private residence), agricultural relief applies. For those entitled to agricultural relief, 90% of the farm value is deductible for CAT purposes.

Figure 4.6 Capital Acquisition Tax on Inheritance

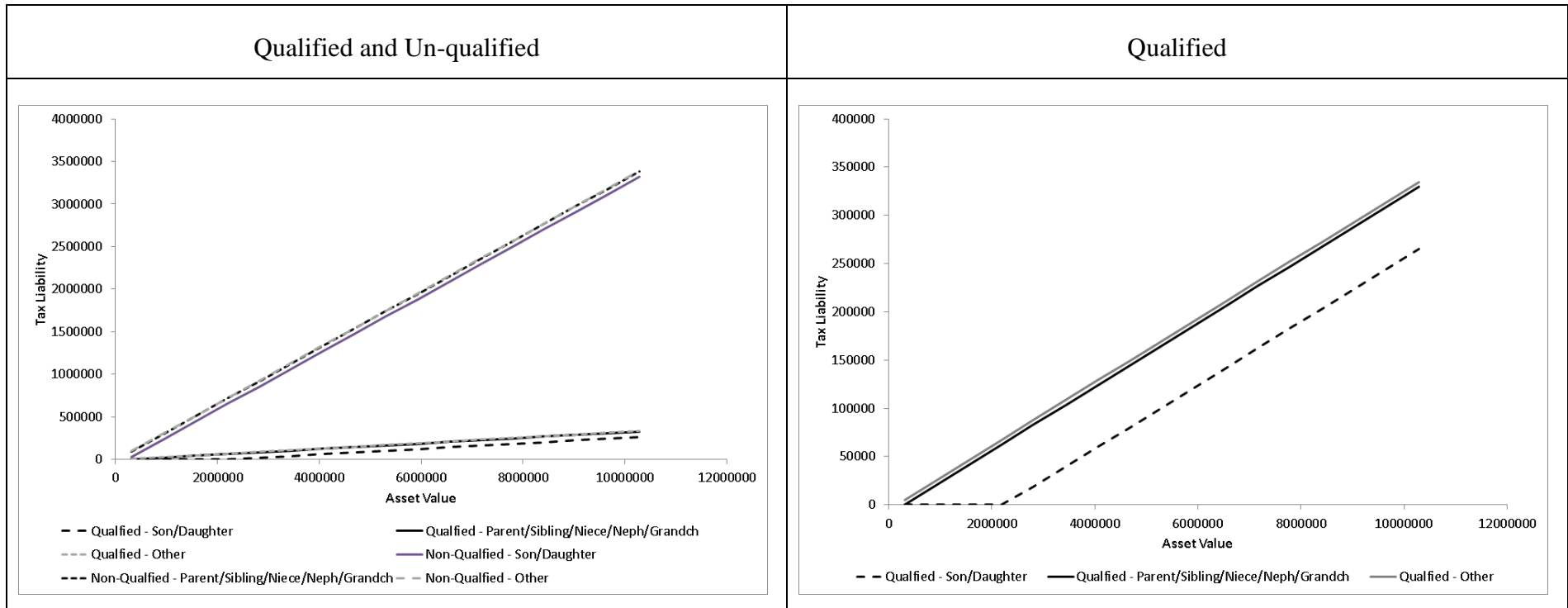


Figure 4.6 highlights the difference in the tax rate that applies upon transfer, depending on whether an individual is entitled to agricultural relief. Agricultural relief is applied by reducing the market value of the agricultural property by 90%, subject to certain conditions, (one of which is that the successor qualifies as a farmer), so that gift or inheritance tax is calculated on the agricultural value. This value is substantially less than the market value. Except in the case of very small farmers with a valuable residence or in the case of those with non-farming businesses, most farm inheritances face relatively low CAT tax bills.

In Figure 4.6, the different tax rate that applies to children as opposed to other transfers to qualified recipients is observed. As many inheritances are to siblings, tax liabilities may be larger. If a beneficiary to an inheritance is a child of the disponent's brother or sister, and certain conditions are met in relation to the inheritance, then favourite nephew/niece relief may be applicable. This relief will entitle the favourite nephew/niece to be treated as a 'child' of the disponent and hence a different threshold applies. The relief will only apply to assets used in connection with the farming business and the niece or nephew must have worked substantially on a full-time basis on the farm for a period of five years ending on the date the disponent ceases to have a beneficial interest in possession in the business.

Capital Taxation – Stamp Duty

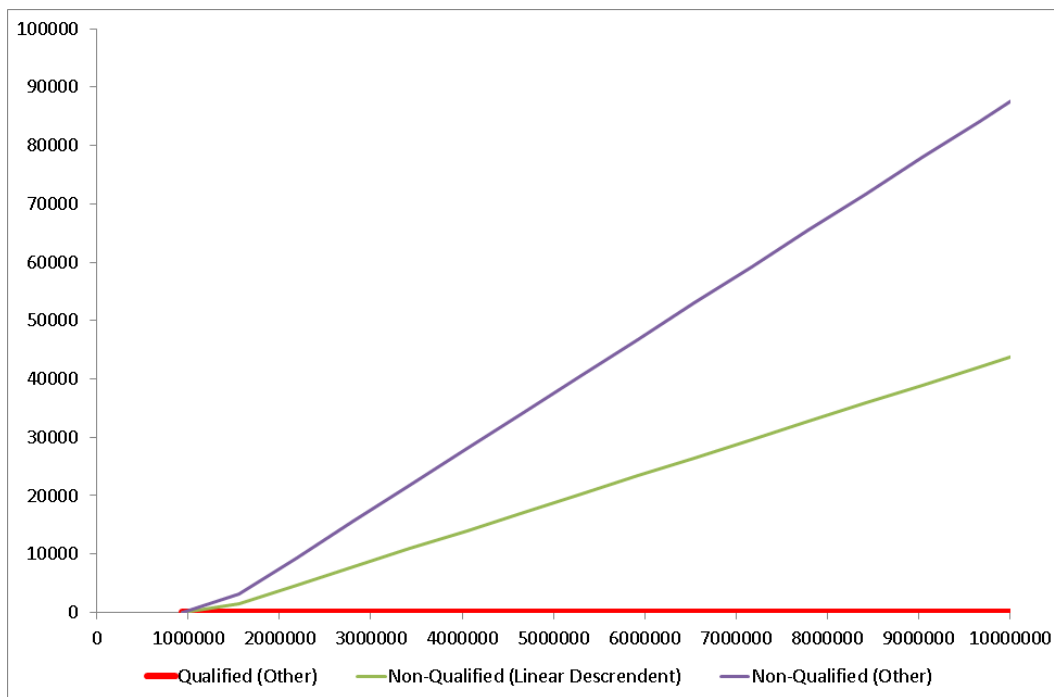
A second tax that is due when land is transferred is Stamp Duty. Although this tax was set at a higher rate and was more complicated historically, a simplified system was introduced in 2010, with a flat rate of 2% on non-residential property and land. For residential property, assets of less than €1 million have a lower rate of 1%.

In order to incentivise farmers to acquire agricultural qualifications, a relief is provided to farmers with a minimum level 6 agricultural certificate (Green Cert) and who work at least 50% of their time in farming. Individuals who inherit farms with these characteristics and who are under 35 years of age upon inheritance do not pay Stamp Duty. For linear descendants of a farmer, who do not meet one of these criteria, Consanguinity Relief is provided where a rate of 1% Stamp Duty is levied.

The Teagasc Formal Agricultural Education Report (Heanue & O'Donoghue, 2014) cites existing Irish evidence on returns to agricultural education in terms of technological/practice change and innovation. Farmers who have completed formal agricultural education are 13% more likely to be prepared to grow GM crops (Keelan et al., 2009), have re-seeded more than 12% of their land in the past three years (Heanue & Buckley, 2012) and are 6% more likely to consider growing bioenergy crops (Clancy et al., 2011).

Figure 4.7 details the difference in Stamp Duty paid by individuals with different qualifying criteria. Stamp Duty applicable to 'Non-qualified (Other)' successors refers to successors who have not attained a minimum level 6 agricultural certificate and who are not a linear descendent. In this instance, Stamp Duty is charged at 2% of the value of the property. However, this Stamp Duty can be reduced to 1% based on the relationship of the farmer and the successor, i.e. a non-qualified linear descendant. In the case that the successor is a son/daughter (or classified as a favourite niece/nephew) of the farmer, and is qualified (under the age of 35 with a minimum level 6 agricultural certificate), Stamp Duty is reduced to zero.

Figure 4.7 Stamp Duty



Capital Taxation – CGT

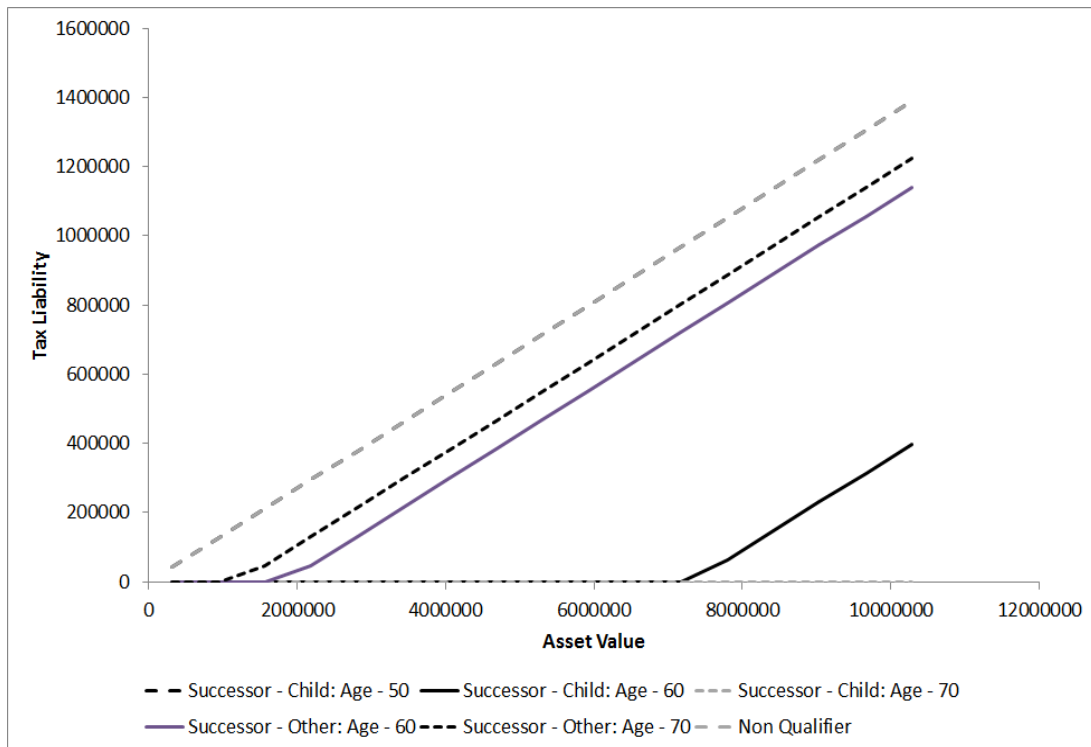
A capital gain applies to the change in value of an asset between the time of purchase and the time of sale. If a farmer transfers their farm to a successor, then the farmer potentially becomes liable for Capital Gains Tax (CGT). This capital gain incurs a tax liability of 33%.

As in the case of other capital taxes, there are specific reliefs available for the agricultural sector. If a farmer is over 65 and transfers a farm to a child or a spouse, then they are exempt from CGT. If they are over 65 and transfer to someone else, there is an allowance of €500,000. If they are aged 55-65, the allowance is €750,000. If a farmer is aged 55-65 and transfers to a child or spouse, the allowance is €3m.

Figure 4.8 highlights the different CGT liabilities incurred, depending on successor type, asset levels and age, as per the criteria as discussed above. There is substantially lower tax relief for younger linear successors, relative to those who do not qualify for CGT relief. Figure 4.8 models the impact of a dairy farmer with a farm of different sizes, transferring the farm at different ages to a child, another successor and to an individual who does not qualify for any relief.

The successor who is not qualified, either through relationship or without agricultural education, or who has not spent enough time farming (10 years), has a relatively small exemption limit, and is liable for 33% of the value of the transfer. The same applies to an individual who transfers the farm at under 55 years of age. There is no CGT on transferring the farm to a child when aged over 65, with lower exemptions for child successors when the farmer is aged 60 and when the successor is not a child but the farmer is at least 60 years old. Thus, there are significant reliefs for farm successors.

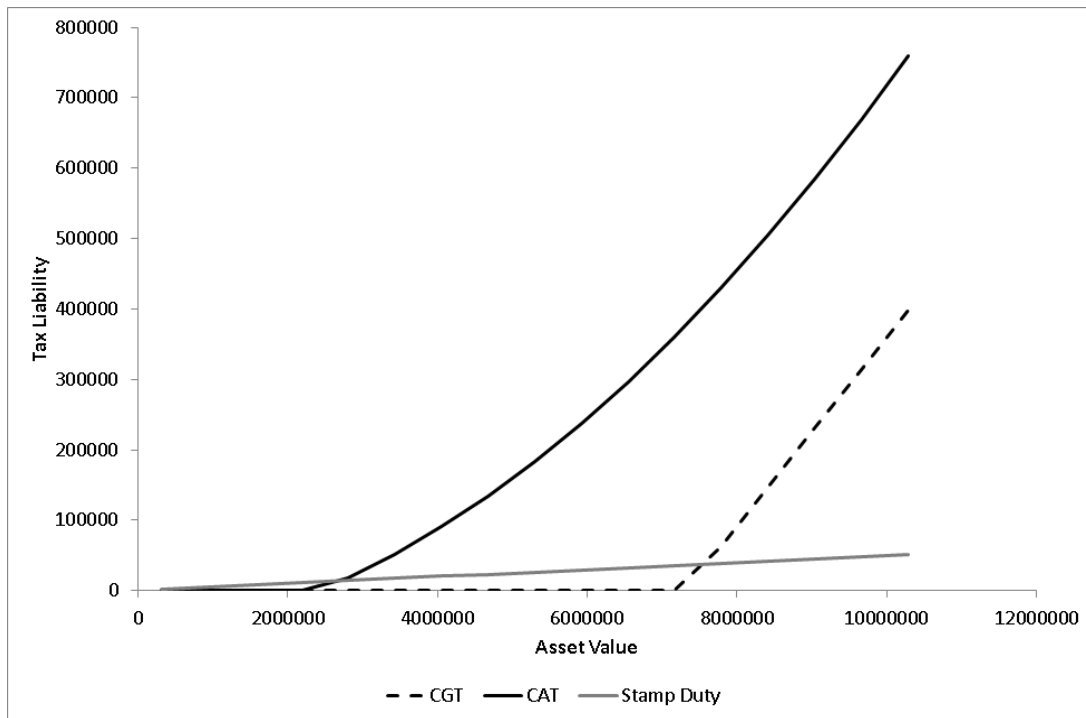
Figure 4.8 Capital Gains Tax on Transfer



Capital Taxation – Transfer and Retirement

If a farm is transferred at the point of death, then no CGT applies. However, the CAT and Stamp Duty apply. Figure 4.9 describes the structure of Capital Taxation for a child successor when a farmer is aged 60. While Stamp Duty kicks in earlier, the value is lower than the others. The CAT associated with the transfer to the successor has the highest value.

Figure 4.9 Capital Taxes Paid on Transfer or Retirement



4.6 CONCLUSIONS

In this chapter, the development of a hypothetical microsimulation model to simulate agricultural taxation is described. To the author’s knowledge, the model is one of the first firm tax models built for farm businesses. In this model, the farm and the wider farm household unit is the unit of analysis. The model can generate a variety of differing budget constraints including:

- Asset Value;
- Forestry Value;
- Livestock Unit;
- Hectares of Land.

In this way, the model can be used to assess the marginal impact of decisions varying from farm management stock decisions, asset disposal and acquisition, farm leasing and afforestation decisions on net income.

As in other hypothetical models, it faces the disadvantage of not capturing the full population. While the objective of incorporating population variability is a valid one, it faces the challenge of the lack of a population dataset that incorporates the variety of

data at household and at farm level, which would be required to calculate the range of instruments.

Nevertheless, the model provides a useful advantage in being able to provide analysis to incorporate some degree of heterogeneity, while abstracting from full population heterogeneity, providing a useful analytical and communication device for farm policy decisions. Because of the simplistic nature, it is feasible to extend this framework to a cross-national setting, potentially combining the EUROMOD tax-benefit environment, with the objectives of the Agri-Benchmark network, to improve our understanding of comparative farm incentives.

ANNEX 1

Table 4.5 Policy Parameters

<i>Group</i>	<i>Relationship to Disponer</i>	<i>8/4/09 to 31/12/09</i>	<i>1/1/10 to 7/12/10</i>	<i>8/12/10 to 06/12/11</i>	<i>07/12/11 to 05/12/12</i>	<i>6/12/12 to 13/10/15</i>	<i>14/10/15 to present</i>
A	Son/Daughter	€434,000	€414,799	€332,084	€250,000	€225,000	€280,000
B	Parent*/Brother/ Sister/Niece /Nephew /Grandchild	€43,400	€41,481	€33,208	€33,500	€30,150	€30,150
C	Relationship other than Group A or B	€21,700	€20,740	€16,604	€16,750	€15,075	€15,075

*In certain circumstances a parent taking an inheritance from a child can qualify for group A threshold

Chapter 5. INSTITUTIONAL DRIVERS OF LAND MOBILITY IN IRELAND

This chapter uses the microsimulation model developed in the previous chapter to compare financial returns deriving from a range of agricultural land use options in order to examine the effect of policy instruments on land mobility in Ireland. Using socio-economic data from the Teagasc NFS, hypothetical farms are created using a microsimulation approach to compare incomes across farm systems and land use options. Financial returns for the hypothetical farms are assessed under a variety of land use scenarios in the context of tax and subsidy policy. The analysis finds that in numerous hypothetical scenarios, leasing out agricultural land on a long-term basis can prove more profitable for cattle and tillage farmers than farming the land. Only dairy farmers derive consistently higher disposable incomes from farming their land as opposed to leasing it out. In terms of land demand, land can also be a significant cost for new entrant dairy farmers but renting land is not an impediment to profitable dairy farming.

5.1 INTRODUCTION

Land is a fundamental requirement for pastoral agricultural systems. Productivity gains in these forms of agriculture can be highly dependent upon the quality of the land or the facilities present on the land area. Substantial investment can be required to improve land quality or to construct new farm infrastructure. In order to derive an acceptable return on these investments, farmers need to be able to retain the use of their land for a reasonable period of time. Therefore, length of land access and well-functioning land markets are key issues for land mobility, incentivising agricultural investment and increasing productivity.

Institutional factors play an important role in determining rates of land mobility. Generally, tax policy affects land markets by imposing transaction costs during land transactions. Taxes on land transactions (purchase, sale or land rental) can affect land supply and demand, thus influencing the price of land (Ciaian et al., 2012a). Subsidies can be capitalised into agricultural land values or rents, distorting the price at which agricultural land can be accessed (Goodwin et al., 2005; O'Neill & Hanrahan, 2012). Subsidy policy can also influence land markets more subtly as farmers may avoid land markets for fear of forfeiting current or future subsidy entitlements (Raggi et al., 2011). Other institutional factors may also influence the demand and supply of land such as

land market institutions (Attwood, 1965; Ciaian et al., 2012b, 2012c), planning regulations (OECD, 2008) and credit market constraints (Blancard et al., 2006). The primary institutional factors of concern in this chapter are tax and subsidies.

Socio-cultural drivers can also provide an important context to land mobility. In agrarian economies, land not only acts as the main means of generating a living but also as the primary channel to transfer wealth between generations (Deininger & Feder, 2001). Land owners' attachment to the land can also affect land mobility, with cultural and social norms dictating how farmers acquire and dispose of land (Donnellan et al., 2008). Supply and demand of land are not determined solely by economic factors but also the social and cultural framework in which land exists (Robinson & Flora, 2003).

Rates of land mobility vary greatly from country to country. Ciaian et al. (2012d, 2012e) and Ciaian, Kancs and Swinnen (2010) analyse land rental and sales markets in the European Union (EU). A large amount of variation in the amount of rented utilised agricultural area (UAA) is identified, with the share of rented land ranging from 17% in Romania to 89% in Slovakia. Land sales markets are typically thinner than rental markets, with less than 2% of UAA typically being sold every year in EU member states. Ciaian et al. (2012e) identify transaction costs and credit market imperfections as reasons why agricultural land sales markets are thin and sales prices do not necessarily evolve in concert with rental prices.

Previous studies addressing institutional factors affecting land markets have concentrated on the influence of agricultural subsidies on the purchase or rental price of agricultural land (Barnard et al., 1997; Killian et al., 2008). This study focuses on an alternative aspect of agricultural subsidies: how do institutional factors (including subsidies) drive the decision-making of farmers in regards to making land available? Since it is generally assumed that prices will adjust so that supply matches demand in land markets, most studies focus on how these prices are determined. However, a gap in the literature exists in terms of how institutional factors may act to prevent either supply or demand channels from functioning properly. Ireland is an example of how this may occur. Additionally, tax policy usually affects land markets as part of land sale/purchase through taxes on capital gains or stamp duty. This study focuses on how tax policy affects the land rental market. Ireland is unique in terms of encouraging the long-term leasing of land with income tax relief, making it a good case study in this area.

In this chapter, Ireland is selected as a case study for the application of a microsimulation based methodology as Irish agriculture is characterised by pastoral, grass based systems with a high land requirement (Geoghegan & O'Donoghue, 2014). With the removal of dairy quotas in the EU in 2015, a rapid expansion in dairy farming is expected (DAFF, 2010). This expansion of the dairy sector is predicted to lead to an increased demand for land (DAFF, 2010). As a result, agricultural land mobility is of increasing interest to Irish policymakers.

However, Ireland suffers from very low levels of agricultural land mobility with one of the lowest shares of rented land in the EU at 18% of utilised agricultural area (UAA) and land sales of less than 1% of UAA per year (Ciaian et al., 2010). Additionally, the main land rental channel is through the 11-month conacre system, which provides little security for farmers and is unsuitable to the long-term investments expanding dairy farmers are required to make.

Property rights are strong in Ireland and are enshrined as a fundamental right in the Irish Constitution. Although, the Constitution notes in Article 43 that the State can regulate these rights “by the principles of social justice”, the property rights provisions of the Constitution may be limited only in accordance with the common good. The legal and constitutional basis of land and property rights in Ireland is outside the scope of this thesis but it should be noted that Irish policymakers are somewhat constrained in terms of the legislative reforms they can enact in relation to land and land mobility.

It is difficult to determine the direct impact of policy on farmer behaviour due to the complexity of tax and subsidy policy, as well as their overlapping nature. The microsimulation approach, which simulates policy at the micro (farm) level, allows us to abstract from this complexity and consider the institutional pressures that may influence behaviour. This chapter, therefore, employs a microsimulation model using hypothetical data to look at how tax and subsidy policy affects land mobility in the Irish context. The model simulates the impact of tax and subsidy policies on land use choices using a series of hypothetical farms. This allows us to compare levels of financial return from different land uses based on the prevailing tax and subsidy environment. This will give us an insight into the institutional forces that may influence farmer behaviour in terms of land mobility.

The rest of the chapter is laid out as follows. Section 5.2 describes the theoretical basis of the chapter and justifies the modelling scenarios. Section 5.3 outlines the research methodology, specifically microsimulation, as well as the hypothetical data that is used. Section 5.4 outlines the tax and subsidy scenarios that are considered and details the results of the modelled scenarios, while Section 5.5 provides a sensitivity analysis of these results across income and time. Section 5.6 contains the results of the impact of different types of land access on a new entrant dairy farmer while Section 5.7 provides some conclusions and policy recommendations.

5.2 THEORY AND RESEARCH QUESTION

There is a wide literature on how agricultural subsidies and tax policy affect land markets. However, this chapter must also examine how these high level policy drivers function in the Irish context. These theoretical underpinnings influence how policy measures impact choices for farmers, as well as the chapter's hypotheses.

Agricultural Subsidies

Studies of agricultural policy measures designed to support farmer income have found that a second order impact of these income supports has been to influence land prices and land rents (OECD, 2007; Ciaian et al., 2012a) A support payment coupled to production, such as an output price support, is likely to lead to greater production than would otherwise occur. The subsequent increase in demand for inputs (such as land) pushes the price of these inputs up. Floyd (1965) shows that coupled payments influence input prices, with a more dramatic effect discernible for inputs with inelastic supply (such as land).

Models of the impact of decoupled agricultural support payments on land values (Guyomard et al., 2004; Ciaian & Swinnen, 2006, 2009) find that fully decoupled payments have no impact on land values if markets are perfect. However, decoupled policies may affect land values if market imperfections such as transaction costs or credit constraints exist. Many factors can determine the impact of subsidies on land values such as policy type, supply and demand elasticities, accompanying policy measures, market imperfections, land use opportunity costs, institutions and expectations (Ciaian et al, 2012a).

Empirical studies on the impact of agricultural subsidies on land rents and land prices can be divided into two broad groups: land value/price studies and land rent studies. Studies examining the impact of agricultural subsidies on land values include Barnard et al. (1997), Duvivier et al. (2005), and Taylor and Brester (2005). Studies analysing the impact of agricultural subsidies on land rent include Kirwan (2005), Killian et al. (2008), and Ciaian and Kancs (2012). These studies find that land prices and land rents respond positively and significantly to agricultural subsidies. The magnitude of the response varies across studies but the price elasticity has consistently been shown to be less than one (OECD, 2008).

Tax Policy

Tax concessions to farmers and landowners often represent an alternative to policy programmes that require direct government expenditure. A 2005 review observed a number of tax concessions in relation to agricultural land in OECD countries (OECD, 2005). In terms of capital gains, several examples of concessions on gains from agricultural property were found. Special treatment of agricultural land and buildings for taxation on transfer (inheritance and gift taxes, stamp duty) is common, especially for intergenerational transfers. Agriculture also commonly receives concessions on annual property taxes in the form of exemptions for agricultural land and buildings, special valuations at less than market price or unique starting thresholds. The study concludes that the impact of these concessions is to delay exits, raise impediments to new entrant farmers and hamper the structural adjustment in the industry that other policies are trying to promote.

High Level Policy Drivers

Over time, Irish land access policy has shifted from a centralised, top-down system to a bottom-up, market driven approach. The 1923 Land Act reinvented the Land Commission, a pre-independence rent fixing body, as a large-scale purchaser and distributor of land. Subsequently, the commission acted as an important tool in the implementation of a countrywide land structural reform programme (Maguire, 1983). One of the underlying objectives of the Land Commission was to ensure that as the tenants' ownership of land increased, one group of landlords was not replaced by another (Interdepartmental Committee on Land Structure Reform, 1978). As a result,

the leasing of land, excluding 11-month lettings, was subject to the express permission of the Land Commission. Accordingly, landholders were reluctant to seek permission to lease out their land for longer than 11 months, for fear of having their land taken over by the Land Commission, who had the power to acquire land compulsorily (Drudy, 1982; Conway, 1986). The preference for 11 month, or conacre, renting of land has persisted to present times with the system of long-term leasing of land common throughout the rest of the developed world failing to evolve in Ireland.

As policy attention has switched to the usage rather than the ownership of land, land access has become an increasingly important issue. One of the main policy planks in terms of increasing land access has been the introduction of measures to increase the leasing of land over longer periods of time than 11 months. These measures have focused on tax incentives designed to stimulate greater activity in the rental market. Under these incentives, income derived from the long-term leasing out of land was exempt from income tax up to specified limits. In contrast, the income from conacre renting is treated as regular income and is taxed as such. Over time, these exemption limits have increased, with higher limits being added for leases of longer periods. By 2015, up to €40,000 per year can be earned free of income tax for leases of 15 years or longer.

Subsidy policy changed with the 2013 reforms to the Common Agricultural Policy (CAP). A new payment scheme for farmers entitled the Basic Payment Scheme (BPS) was introduced, replacing the old Single Payment Scheme (SPS) or Single Farm Payment (SFP). Under the BPS, a new set of entitlements are allocated to farmers in 2015. The BPS operates in much the same way as the current SPS, with an application submitted each year in which the farmer declares all of their land, specifying which hectares are eligible for payment.

In the Irish context, the implementation of the BPS system illustrates how the links between land access, entitlements and subsidy payments may influence farmer behaviour. Ambiguity surrounding the details and conditions of the BPS led to uncertainty regarding leasing entitlements in 2014 and the validity of these entitlements from 2015 onwards. Under the new BPS rules, if a farmer leased out the entirety of their land in 2013 and did not farm themselves in that year, they would not be allocated entitlements under the new scheme in 2015. This effectively forced farmers in this

situation to sell their SPS entitlements before they became void in 2015. The penalisation of farmers who had entered long-term lease arrangements by the CAP reforms highlights how subsidy policy can foster uncertainty and encourage short-term thinking amongst farmers.

Irish Context

Cattle farming is currently the dominant form of agriculture in Ireland, accounting for 57% of land (Geoghegan & O'Donoghue, 2014). Dairy farming accounts for 14.9% of agricultural land, with sheep farming taking place on 12.3% of land. Tillage farming takes up 8.6% of agricultural area. Cattle farming uses the most good quality soil (54.5%), followed by dairy farming (17.1%) and tillage (14.8%). As would be expected, almost all tillage farming takes place on good quality soil. Cattle farming also dominates the use of medium quality soil (64.1%), with dairy farming taking up 14.6% and sheep farming 10.8%. Poor quality soil comprises 11.4% of agricultural land with cattle (46.8%) and sheep (32.4%) farming taking up the vast majority of this type of land.

Although these shares of agricultural land by farm system have remained largely similar over recent history, this situation is expected to change once the dairy quota is removed and demand for land for dairy purposes increases (Dillon et al., 2008). Since dairy farming in Ireland uses an outdoor, grass-based feeding system rather than an indoor, feed-based one, good quality pastoral land is a key requirement for Irish dairy farmers (O'Donnell et al., 2008). Land also needs to be close to the milking facilities to enable cows to be close at hand for regular milking. Additionally, due to the infrastructure required by dairy farmers, land either needs to be owned or available on a long-term basis in order for infrastructural investments to yield a return.

The land requirements for cattle and sheep farms are not as specific as those for dairy. Land quality is of lesser importance, especially for sheep farms, which tend to be quite extensive. Infrastructural requirements are less onerous compared with dairy farms so land can be rented without investment being required to upgrade it, enabling shorter rental periods. Additionally, animals on cattle and sheep farms do not have to be moved as often as on dairy farms, so keeping animals on fragmented land parcels is less of an issue for these farmers. Tillage farms, the other main farm system in Ireland, also

require good land and infrastructural investment (often in the form of equipment) but the time and capital investment required to shift from pasture to tillage (and vice versa) means that land often stays in one system or the other.

Agricultural land can be accessed or released in many ways. Firstly, it can be permanently transferred whether through purchase, sale or inheritance/gift. Secondly, it can be temporarily transferred by way of rent or lease. Thirdly, land can be shared through some sort of cooperative or partnership arrangement. Finally, land use can be changed, whether from one farm system to another (e.g. cattle farming to dairy farming), through the planting of crops or forestry, or by the rezoning of land from agricultural to commercial or residential use.

In an Irish context, permanent transfers of land comprise a relatively small part of the overall land market. Farms are mainly owner operated, with a strong desire amongst farmers for land to remain within their family when they retire or die (Donnellan et al., 2008). As a result, farmers can generally only access land through the rental market. However, the Irish rental market is limited in many ways. The main rental channel is through the 11-month conacre system where land is only rented for 11 months at a time. Long-term leases (leases longer than five years) are used less often by farmers, despite generous tax incentives to encourage their adoption. Farmers have difficulty accessing land and even when land can be accessed, they can rarely secure it for a long period of time.

Measures of Impact

Of primary importance in the discussion of how tax and subsidy policy affect land access is how these policies impact the financial return an area of land provides for a farmer. In the context of a given set of policy and socio-economic conditions, would a farmer derive a greater financial reward from farming the land themselves or through allowing their land to be accessed by other farmers? The measure of financial return used will be net farm income, which is defined as the farm's total gross output (including subsidies) less total net expenses (including tax). This measure allows us to incorporate changes in subsidy and tax policy into a single figure, which can then be used to compare financial outlooks for different land use scenarios. The differences in

terms of financial return under alternative land access arrangements will provide insight into how different policy initiatives impact farm incomes and access to land.

Model

In this model, a farmer can choose to either farm their land or lease out their land, depending on the income derived from each activity. Incomes are compared to potential income derived from alternative land use choices as follows:

$$Y = (FI + SI) * (1 - \tau) + LI * (1 - \tau_{LI}) \quad (16)$$

where Y is total income, FI is farm income, SI is subsidy income, LI is lease income and τ is the effective tax rate on farm income and τ_{LI} the effective tax rate on lease income, incorporating long-term lease tax deductions. Equation 17 shows that farm income is a function of land quantity (L), human capital (H), farm system (S), agronomic quality of the land (A) and exogenous factors (Z). Lease income is a function of land quantity and the agronomic quality of the land.

$$FI = f(L, H, S, A, Z) \quad (17)$$

$$LI = f(L, A) \quad (18)$$

Two types of subsidy payment are modelled in this paper: the Single Farm Payment (SFP) and other payments including the Disadvantaged Area Scheme (DAS) payment. The SFP is determined by the same factors as farm income but in different ways. Land quantity (L) determines the number of entitlements a farmer can draw payment on. Human capital (H), farm system (S) and agronomic characteristics (A) determine current subsidies through the historical basis of subsidy payments². The DAS payment is determined by L as the payment is capped at a certain number of hectares and by A as payment rates can differ depending on the agronomic quality of the land. However while Single Farm Payments were positively correlated with agronomic quality, DAS payments were higher on poorer agronomic areas and so is likely to be negatively correlated with agronomic quality.

² More productive farmers received larger subsidy payments before payments and production were decoupled in Ireland. Productivity is highly influenced by the agronomic quality of the land. Farm systems were associated with different types of subsidy payment and payment levels before decoupling occurred, which carried over into subsidy payments post-decoupling.

$$SI_{SFP} = f(L, H, S, A, Z) \quad (19)$$

$$SI_{OTH} = f(L, A) \quad (20)$$

As subsidies follow the farmer, the value should not theoretically impact upon the decision to lease as the recipient of the subsidies can incorporate them into the value of the lease payment. Similarly, subsidies may be capitalised into land sales values. They may thus result in land lease and land value inflation.

Assuming the farmer wishes to maximise their income, the following decisions arise:

- if $FI + SI > LI$, then farm;
- if $FI + SI = LI$, then farm or lease out;
- if $FI + SI < LI$, then lease out.

A complexity arises during reference years, where a farmer who owns the land must be farming (all or part) of the land in order to be eligible to receive payments for the following seven year CAP period. If the land is leased out, then a land owner may not be deemed to be farming the land and so will lose entitlements, which will have an impact on future income streams. The question therefore is whether tax deductions for long-term leases negate the potential long-term subsidy loss.

This chapter concentrates on how farm system (S) and human capital (H) influence the land use decision. Returns vary greatly depending on the farm system employed by the farmer while the farmer's human capital influences the farmer's skill level. Land quantity and the agronomic quality of the land are kept constant.

Hypotheses

This chapter looks to examine what effect policy initiatives have on financial drivers of agricultural land availability. Given the static nature of the Irish land market, especially in the light of increasing demand for land, possible constraints on the supply side of the market must be examined. One possible constraint is that farmers make a better financial return from farming their land compared with the possible return from leasing

out their land. If this were the case, it would be rational for farmers to maintain their land rather than let others access it.

Initiatives such as tax incentives for the long-term leasing of land are specifically designed to increase land mobility. However, the inability of long-term leases to achieve common usage in Irish agriculture despite the fact that these tax incentives have been in place for three decades suggests that the policy initiative warrants deeper investigation. Due to the low income of many farmers and the progressivity of the income tax system, many farmers may end up paying little or no income tax each year. As a result, incentives that offer income tax reduction would be irrelevant to these individuals.

Access to land is also affected by policies where land access is a prerequisite for availing of the policy, such as access to agricultural subsidies. In a situation where subsidies are required to cover losses at a market level, as is the case for the average Irish cattle farmer (Hanrahan et al., 2014), any action which may endanger the receipt of these subsidies will not be taken lightly. Therefore, although rental income may surpass farm income (including subsidies), the guaranteed nature of subsidy payments (subject to meeting minimum guidelines) means that farmers may be wary of making decisions that could put their future subsidy income at risk. This chapter asks to what extent subsidy income can be affected by farmers' land use decisions.

On the demand side of the land market, the ability of new entrants to access land affordably is examined. Farmers who are choosing to become more intensive in their farming activity, especially those entering or expanding into dairy farming following quota removal must be able to access land at a price that is affordable given set-up and infrastructural costs and the repayment of borrowings that would likely be required. This chapter asks whether the requisite financial return can be delivered in the medium term when extra land is accessed through the long-term lease system.

5.3 METHODOLOGY AND DATA

Methodology

Due to the heterogeneous nature of farm households and the complexity of the policy instruments involved, it is difficult to capture the direct impact of tax and subsidy policy

on farmer behaviour. The actual behaviour of farmers in terms of land mobility only informs us indirectly about the policy pressures on farmer behaviour due to the presence of numerous factors both related and unrelated to the overarching policy structure affecting farmers' land mobility decisions. Therefore, in order to assess these policy pressures directly, a model that simulates policy at the farm level but that can also deal with the complexity of the policy instruments is required. Microsimulation modelling is a micro-based simulation methodology that will be utilised here (See O'Donoghue, 2014).

This chapter uses a hypothetical microsimulation model to compare farm income for a number of hypothetical farms in order to simulate how alternative tax and subsidy policies can influence land mobility choices. Burlacu et al. (2014) describes the contexts in which hypothetical models are used: illustrative purposes, validation, cross-national comparisons, replacement of micro data and communication with the public. A hypothetical model is used in this chapter for data and illustrative reasons. Firstly, the lack of land mobility in Irish agriculture means that there is a lack of data on the incomes of farmers who allow others to access their land. The hypothetical model allows us to create such data. Additionally, the hypothetical model allows us to abstract from the complexity of the relevant tax and subsidy policies in order to provide illustrative examples of how these policies impact the financial return of farmers.

Microsimulation models use data on micro-units (e.g. individuals, households, firms, farms, etc.) to simulate the effect of policy or other socio-economic changes on the population of micro-units (Mitton et al., 2000). Microsimulation models act as *ex-ante* evaluation tools that generate synthetic micro-level data which illustrate counterfactual situations that would prevail under alternative scenarios, *ceteris paribus*. Hypothetical microsimulation models are often used in a different context than the traditional static or dynamic microsimulation models. Hypothetical models usually focus on a particular scenario under certain predefined assumptions, which allows us to examine the practical significance of hypothetical policy reforms. The International Farm Comparison Network simulates farm level profits to compare farm systems across countries at a synthetic farm level (Hemme et al., 2000; Thorne & Fingleton, 2006). McCormack et al. (2014) used a hypothetical model to examine how subsidy policy created behavioural pressures amongst Irish beef farmers.

A wide variety of alternative farm-level models exist in the literature (Ciaian et al., 2013). Linear programming models are a subset of optimisation models, which operate by optimising or minimising an objective function subject to a set of constraints. Linear programming models operate on the assumption that both the objective function and the problem constraints are all linear. Most linear programming farm-level models are designed to maximise a profit function subject to a set of resource constraints, representing the land, labour and capital available to the farm (Richardson et al., 2014). Simulation models focusing on individual farm modelling of large datasets rather than representative or farm-type modelling have also become more common as data sources have become richer and computing power has increased (Richardson et al., 2014). These models have the advantage of better representing the heterogeneity among farms, providing the most possible disaggregation regarding farms and activities, and reducing aggregation bias in response to policy and market signals (Ciaian et al., 2013).

However, these alternative models are not best suited to the current study. In terms of linear programming models, this study is not examining how farmers can optimise profits but how subsidy and tax policy can influence farmers' decisions regarding land use and land mobility. This study also looks to abstract from the complexity of the relevant tax and subsidy policies, as well as the numerous factors both related and unrelated to the overarching policy structure that influence farmers' land mobility decisions. A more advanced microsimulation model involving real, individual farms would instead make the model more complex and prevent such abstraction. Therefore, a hypothetical microsimulation model is utilised.

Burlacu et al. (2014) identify the choices that are relevant for hypothetical models in terms of identifying the parameters that have been selected and the context of their application (see Table 5.1). In the model used in this chapter, it is characterised as a stand-alone model with a farm unit analysis, simulating over a relatively long period and so is an inter-temporal model. The unit of variation used in this study is the impact of land use decisions on different farm systems. The analytical method used is net farm income.

Table 5.1 Choices for hypothetical model

<i>Interaction with another model</i>	<i>None – bespoke model used</i>
The unit of analysis	Farm unit
Period of analysis	Long-term (5-15 years)
Unit of variation	Land use decision (farm/lease land)
Analytic measures	Relative net farm income

Data and Model Assumptions

In order to examine the range of Irish farm systems and farm incomes, representative farms of the main farm systems in Ireland are employed: dairy, tillage and cattle finishing.

Data from the Teagasc National Farm Survey (NFS) is used to build the hypothetical farms. All farms are the same size, 40 hectares, which is the same as the average NFS cattle finishing farm in 2013. This is to prevent farm size effects from impinging on the net income results.

Table 5.2 contains the key parameters used in the model. All parameters are derived from the 2013 NFS (Hanrahan et al., 2014).

The average family farm income (net income before taxes) per hectare differs across the farm systems since farm incomes differ greatly across systems. For dairy farms, it is €1,137 per hectare; for tillage farms, it is €460 per hectare; and for cattle finishing farms it is €389 per hectare. This income includes subsidies received by the farmer. The farm market income referred to in the subsequent analysis is therefore the income per hectare according to system multiplied by the farm size (40 hectares).

The price for leasing one hectare of land is €350, which corresponds to the rental price for good quality land in the NFS. Good quality land is chosen as the majority of land rented by Irish farmers is of this type. Additionally, demand for good quality land is anticipated to increase due to the anticipated expansion of dairy farmers following quota removal. Land of poorer quality would be less expensive to rent than good quality land but may not be of good enough quality for renting farmers, especially those with dairy or tillage systems.

The average price of a direct payment entitlement differs according to farm system. The average dairy entitlement value is €300, compared with €349 for cattle finishing systems and €368 for tillage farms. Each entitlement must correspond with one hectare

of land so it is assumed that each farmer has 40 entitlements to match their 40 hectares of land.

The average NFS value for one hectare of silage is €75. Additionally, the Disadvantaged Area Scheme payment is worth €82.27/ha, with a maximum of 30 hectares allowable under the scheme.

The income tax schedule for farm and lease income is shown in Figure 5.1. Farm income is taxed normally with a married farmer's income being subject to 20% tax up to €42,000 and 41% tax on all income after that amount. Lease income is exempt from income tax up to and including certain amounts, depending on the length of the lease agreement. Leases of five to six years are exempt from income tax up to and including the first €18,000 of lease income. Leases of seven to nine years are exempt up to the first €22,500, those of ten to fourteen years the first €30,000 and those of fifteen years are greater are exempt up to the first €40,000 of lease income. Any lease income exceeding these amounts is taxable at the marginal rate.

The tax rates and lease income exemptions used in the model are from 2015 and are listed in Table 5.3. PRSI is a form of social insurance for the self-employed, which the vast majority of farmers are, pay at a rate of 4% on gross income (including lease income). The Universal Social Charge (USC) is a tax paid on gross income (including lease income), starting at 1.5% on the first €12,012 of income, 3.5% on the next €5,564, 7% on the next €52,468 and 8% on the balance of income. An income tax credit of €3,300 for married individuals is also modelled. The income tax schedule and lease income exemptions have been explained in the previous paragraph.

It is assumed that the farmer is married and less than 65 years of age for the entire period studied and that tax/exemption rates remain the same from 2015 onwards. All monetary amounts used in the chapter are nominal.

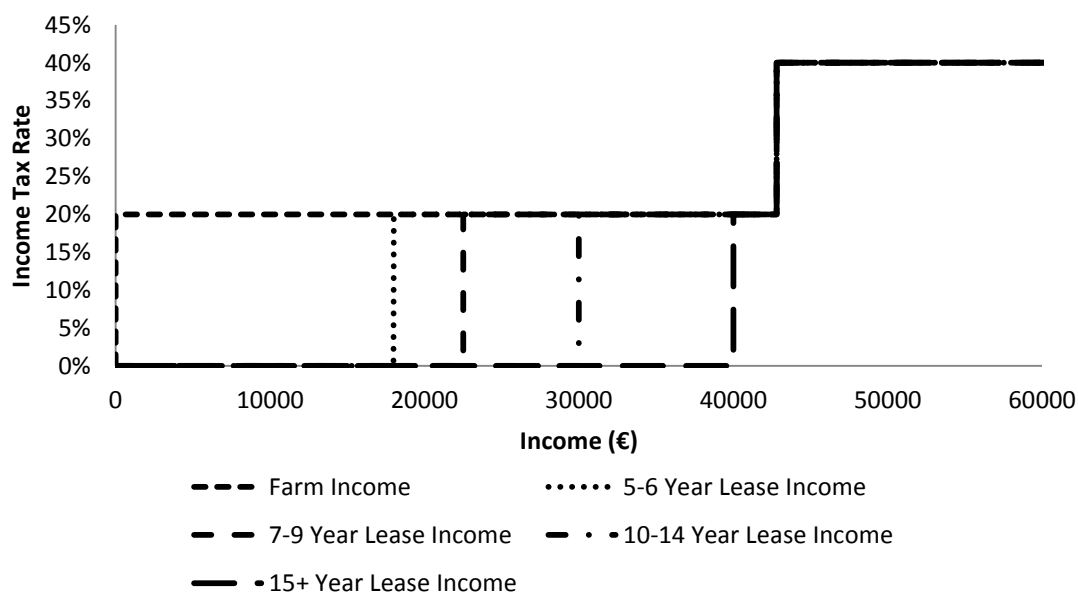
Table 5.2 Key Parameters Used in Model Scenarios, 2013

Item	2013
Average Dairy Family Farm Income	€1,137/ha
Average Tillage Family Farm Income	€460/ha
Average Cattle Finishing Family Farm Income	€389/ha
Lease price	€350/ha
Dairy Entitlement value	€300/ha
Tillage Entitlement value	€368/ha
Cattle Finisher Entitlement value	€349/ha
Silage value	€75/ha
Disadvantage Area Scheme payment	€82.27/ha (30ha max)

Table 5.3 Key Tax Figures Used in Model Scenarios, 2015

Item	2015
Income Tax (Low Rate)	20%
Income Tax (High Rate)	41%
PRSI	4%
Universal Social Charge (USC)	1.5% – 8%
Married Income Tax Credit	€3,300
Leasing Income Tax Exemptions:	
5-6 year lease	First €18,000 exempt
7-9 year lease	First €22,500 exempt
10-14 year lease	First €30,000 exempt
15+ year lease	First €40,000 exempt

Figure 5.1 Income Tax Schedule for Farm and Lease Income in 2015



On the demand side of the land market, the case of a farmer who wants to expand their land holdings through long term leasing is studied. Since it is expected that dairy farmers will demand more land following the removal of the milk quota, the example of an expanding dairy farmer is used.

Table 5.4 Key Parameters for Dairy Expansion Model

<i>Item</i>	
Land area	58 ha
Cow numbers	180
Capital investment	€672,225
Borrowings	€1,989/cow
Interest rate	5.5% per annum
Milk yield	5,415 kg/cow
Milk solids	1,248 kg/ha
Milk price	27 cents/L

The dairy expansion scenario uses parameters from McDonald et al. (2013a) and Teagasc (2011) to model a cattle farmer moving into dairy farming following the removal of the milk quota in 2015. McDonald et al.'s data on new entrant dairy farmers is employed (see Table 5.4), as well as figures from their full scale, no quota dairy expansion scenario. This scenario involves 180 animals being bought and milked from year one of expansion and all surplus heifers being sold. Profits are discounted at a yearly rate of 5.5%.

5.4 SCENARIOS

We model four scenarios to examine how fiscal rules, such as tax incentives, affect farms differently depending on the policy context and the decisions of individual farmers. Farm incomes are compared to potential incomes derived from alternative land use choices. Incomes are compared across a seven year period as leases must be at least five years long to qualify for income tax exemption. The scenarios are as follows:

- Baseline Scenario – Farm income without leasing out land and entitlements over a seven year period.
- Lease Scenario - Income derived from leasing out land and entitlements over a seven year period.
- Entitlements Sale Scenario – Compares farm income to income derived from leasing out land over a seven year period and selling entitlements after the first year of the lease following CAP policy change.
- Active Farmer Scenario – Compares farm income to income derived from leasing out land and entitlements over a six year period following CAP policy change.

Lease Scenario

In order to look at the effect tax-based lease incentives can have on net income, baseline farm income is firstly compared with lease income without the complication of the 2015 CAP reforms. This allows a comparison of farm and lease incomes before a new policy change is enacted.

In this baseline scenario, the following assumptions are made:

- A seven year time period from 2016 to 2022 is modelled. This scenario avoids the issues posed by the CAP reforms to be introduced in 2015 by starting in 2016.
- Income from dairy, tillage and cattle finishing systems on a 40ha farm is compared with potential lease income from the same time period.
- The lease side of the scenario has the farmer signing a seven year lease in 2016, running until 2022 where both land and entitlements are leased out.
- We assume the farmer is married and less than 65 years of age throughout the seven year period for tax purposes

The results are shown in Table 5.5. Over the seven year period, the hypothetical dairy farmer would have net earnings of €245,000 from farming, the tillage farmer €118,000 and the cattle finishing farmer €103,000.

With the ability to lease out both land and entitlements over the entire seven year period, potential net lease and entitlement income is €170,000 for the dairy farmer, €188,000 for the tillage farmer and €183,000 for the cattle finishing farmer. Reflecting the difference in farm income, net dairy incomes are higher than net lease incomes, while the, tillage farmers could potentially see a higher income from leasing out land than farming, earning 37% less from farming as opposed to leasing out their land and entitlements. The cattle finisher is worse off farming compared to leasing out their land and entitlements over the seven year term. They would earn 44% more from leasing out.

Table 5.5 Seven Year Farm Income vs. Lease Income, 2016-2022 (€000's) - Lease Scenario

	<i>Baseline Scenario</i>						<i>Lease Scenario</i>						Difference Net Farm Income versus Net Lease Income
	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	
Dairy	318		0	84	73	245	0		98	84	12	170	+44%
Tillage	129		0	103	11	118	0		98	103	13	188	-37%
Cattle Finisher	109		0	98	6	103	0		98	98	13	183	-44%

All farms 40ha. Income reflects average per hectare farm income for farm system in 2013. Entitlement income reflects average per hectare entitlement income for farm system in 2013. Farmer is married and less than 65 years of age for entire time frame. Net income reflects income after relevant taxes and tax credits are applied. No discount rate is used as only future incomes are compared.

Table 5.6 Seven Year Farm Income vs. Lease Income, 2013-2019 (€000's) – Entitlements Sale Scenario

	<i>Baseline Scenario</i>						<i>Entitlements Sale Scenario</i>						Difference Net Farm Income versus Net Lease Income
	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	
Dairy	318		0	84	73	245	0		98	33	9	122	+100%
Tillage	129		0	103	11	118	0		98	41	11	128	-8%
Cattle Finisher	109		0	98	6	103	0		98	38	10	126	-18%

All farms 40ha. Income reflects average per hectare farm income for farm system in 2013. Entitlement income reflects average per hectare entitlement income for farm system in 2013. Farmer is married and less than 65 years of age for entire time frame. Net income reflects income after relevant taxes and tax credits are applied. No discount rate is used as only future incomes are compared.

Table 5.7 Seven Year Farm Income vs. Lease Income, 2013-2019 (€000's) with One Hectare Farmed – Active Farmer Scenario

	<i>Baseline Scenario</i>						<i>Active Farmer Scenario</i>						Difference Net Farm Income versus Net Lease Income
	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	Farm Income	Market	Lease	Entitlements	Tax, PRSI	Net	
Dairy	318		0	84	73	245	5		82	83	11	159	+54%
Tillage	129		0	103	11	118	5		82	103	13	177	-33%
Cattle Finisher	109		0	98	6	103	5		82	98	13	172	-40%

All farms 40ha. Income reflects average per hectare farm income for farm system in 2013. Entitlement income reflects average per hectare entitlement income for farm system in 2013. Farmer is married and less than 65 years of age for entire time frame. Net income reflects income after relevant taxes and tax credits are applied. No discount rate is used as only future incomes are compared.

Entitlements Sale Scenario

This scenario looks at how the rules governing access to subsidies can affect the income of farmers. Since CAP payments are accessed based on land use in previous years, new rules in this area can adversely affect farm incomes, depending on the farmer's land use decisions.

A seven year time period from 2013 to 2019 is modelled incorporating the CAP reference year of 2013. Income from dairy, tillage and cattle finishing systems on a 40ha farm is compared with potential lease income from the same time period. In the lease portion of the scenario, the farmer signs a seven year lease in 2013 to rent out their entire 40ha land area at €350 per hectare until 2019. Entitlements are also leased out at face value (€300/ha) in 2013. Due to the CAP changes being introduced in 2015, all entitlements are sold in 2014 as the owner of the land is not an active farmer in 2013 and so will not be granted new entitlements under the BPS in 2015. Selling entitlements allows the farmer to realise a monetary gain from the entitlements before they are rendered worthless by the introduction of the BPS. The entitlements can be sold either on the open market or to the farmer currently leasing them. The entitlements are sold at 1.8 times face value, which reflects market value for sold entitlements. Only the land is leased out from 2014 onwards. It is assumed that the farmer is married and less than 65 years of age throughout the seven year period for tax purposes.

Table 5.6 shows the results for the Entitlements Sale Scenario. If the three farmers decided to lease out their land from 2013 to 2019 and sell their entitlements in 2014 for 1.8 times face value, the dairy farmer would earn €122,000, the tillage farmer €128,000 and the cattle finisher €126,000 after tax over the seven year period. As can be seen in Table 5.6, the dairy farmer would be better off continuing to farm over the seven year period rather than leasing their land out and selling their entitlements. The dairy farmer would earn 100% more over the period, while the tillage farmer would be 8% worse off by farming over the seven years. The cattle finishing farmer would be 18% worse off farming the land from 2013 to 2019 than they would be if they leased out the land for seven years and sold their entitlements in 2014.

Additionally, all three farmers would earn more from leasing both their land and entitlements, as described in the Lease Scenario, than from selling the entitlements and

leasing the land. The dairy farmer earns 48% more from leasing in the Lease Scenario, the tillage farmer 47% more while the cattle finisher is 45% better off.

Active Farmer Scenario

Farmer decisions surrounding land use can have positive effects on farm incomes, depending on the timing of the decisions and how they feed into subsidy rules. This scenario incorporates additional subsidy payments and models a different option for farmers in relation to the 2015 CAP reforms. In addition to the SFP/BPS payment, the farmer also receives a Disadvantage Area Scheme (DAS) payment of €82.27 per hectare on 30 hectares of his land (the maximum allowed). Income from dairy, tillage and cattle finishing systems on a 40ha farm is again compared with potential lease income.

Table 5.7 shows the results for the Active Farmer Scenario. In 2013, the farmer, uncertain of what the future CAP reform will entail, decides to cut silage on their 40ha and sell it at €75 per hectare. They also receive their SFP of €300 per hectare and DAS payment of €82.27 per hectare. With greater knowledge of the CAP reforms in 2014, the farmer enters into a Private Contract Clause and leases out 39 of their 40 hectares on a seven year lease, along with 39 of their entitlements. He holds one hectare and one entitlement to be eligible as an 'active farmer' to receive entitlements under the BPS in 2015. This takes advantage of the eligibility conditions for the BPS, which allows a farmer who leases out part of a holding to establish BPS entitlements in their own name and then lease them out to a lessee for the duration of the lease. However, the lessor must retain at least one hectare of land in order to meet the definition of an active farmer and be eligible to have BPS entitlements established in their name. They continue to lease out the land and entitlements until 2020 but only income until 2019 is compared in order to mirror the first two scenarios.

Compared with the Entitlement Sale Scenario, where the farmer had to sell their entitlements rather than lose them, all three hypothetical farmers earn more by holding onto one hectare of land and remaining eligible for entitlements than if they sold their entitlements outright. The dairy farmer earns 30% more, the tillage farmer 38% more and the cattle finisher 37% more. Comparing farm income to lease income in the current scenario, the tillage farmer would earn 33% more than if they cut silage and leased the land over the seven year period, while the cattle finisher would be 40% better off by

leasing. Only the dairy farmer remains better off farming, earning 54% more over the seven year time frame.

This illustrates the importance of the timing of the lease. Farmers leasing in 2013 lose entitlement to subsidies post-CAP reform and so have to sell them whereas farmers retaining only one hectare of land maintain access to the direct payments system going forward. Therefore, the rules of the policy reform create a perverse incentive for farmers to maintain one hectare and be counted as an active farmer. Given that farmers who lease out all their land (as in the Entitlements Sale Scenario) stand to lose between 30% and 38% of their income as compared with those who retain one hectare of land (as in the Active Farmer Scenario) as result of the policy change, rules within the CAP can seriously affect the return from a specific land use.

5.5 RESULTS: SENSITIVITY ACROSS DIFFERENT FARM INCOMES AND TIME

Farm incomes are quite heterogeneous, differing markedly from farm to farm and from year to year. Average farm income in a particular year may not be representative of farm income in a more general sense. Additionally, nonlinearities in the tax system can affect net farm incomes. As a result, it is appropriate to test the sensitivity of our analysis to different farm incomes.

Figure 5.2 shows the results of running the Baseline Scenario with farms in the 75th percentile of farm income according to the NFS rather the average farm income. This reflects farms in the 75th percentile of dairy, tillage and cattle finishing income. The Baseline Scenario compared incomes from farming between 2016 and 2022 and leasing out all land and entitlements for the same period. The full figures used in Figure 5.2 are in Annex 1 at the end of the chapter.

In this scenario, our hypothetical dairy farmer earns €1,340 per hectare, the tillage farmer €812 per hectare and the cattle finisher €600 per hectare. Net income from leasing out land and entitlements between 2016 and 2022 remains as it was in the original Scenario.

The dairy farmer continues to be better off farming rather than leasing, earning 67% more from farming as opposed to leasing this land and entitlements. The cattle finisher is still better off leasing out their land and entitlements, earning 21% more by leasing

compared with farming the land over the seven year period. Despite being in the 75th percentile of earnings, there is a negligible difference in income (0.1%) for the tillage farmer when comparing leasing and farming.

The Baseline Scenario is also run with farms in the 25th percentile of farm income. Here, farm incomes have fallen to €596 per hectare for the dairy farmer, €405 per hectare for the tillage farmer and €162 per hectare for the cattle finisher. As shown in Figure 5.2, the tillage and cattle finishing farmers are still better off leasing out their land and entitlements rather than farming the land themselves. However, now the dairy farmer is also better off through leasing his land and entitlements compared to farming. The dairy farmer in the 25th percentile of dairy farm income is 12% better off leasing, the tillage farmer 43% better off leasing and the cattle finisher is 77% better off by leasing.

Given that the amount of lease income that is free of income tax is dependent upon the length of the lease contract, it is appropriate that different lease lengths are compared with farm income. Figure 5.3 shows the results of repeating the Baseline Scenario over five and ten year periods rather than over seven years, as was the case in the original scenario. The results show that the percentage difference between farm and lease incomes remains stable across the different lease periods. In the five year scenario, simulated farm incomes over five years are compared with the income derived from signing a five year lease and leasing out land and entitlements from 2016 to 2020. The dairy farmer is 44% better off over the five years through farming while the tillage and cattle farmers would be 37% and 44% respectively better off if they leased out their land and entitlements. In the ten year scenario, the dairy farmer would be 44% better off through farming while the tillage farmer would be 37% better off through leasing. The cattle finisher would also be better off leasing, potentially earning 45% more over the ten years. The full figures used in Figure 5.3 are in Annex 1 at the end of the chapter

Figure 5.2 Lease Income vs. High/Low Farm Income, 2016-2022 (€000's)

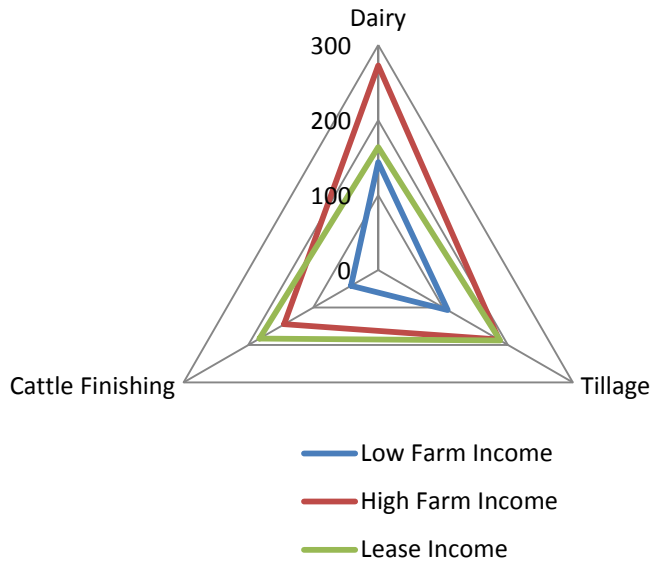
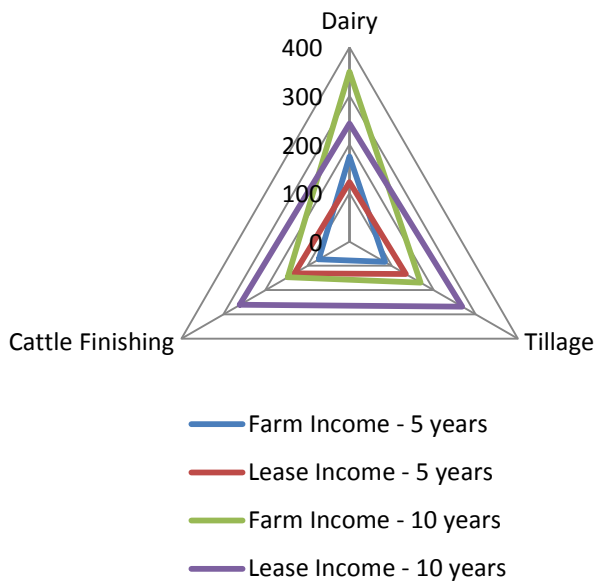


Figure 5.3 Lease Income vs. Farm Income, 5 Year Lease & 10 Year Lease (€000's)



5.6 RESULTS: DAIRY EXPANSION SCENARIO

Having examined the institutional factors affecting the supply of land in the previous section, land demand is now examined. For farmers choosing to become more intensive in their farming activity, accessing extra land can play an important part in future plans. Those entering or expanding into dairy farming following quota removal must be able to access land at a price that is affordable given set-up and borrowing costs. McDonald et al. (2013a) model the potential financial return for a new entrant dairy farmer on a 58ha farm in a post-quota environment. However, this model fails to account for the potential land requirement that may be necessary for expanding dairy farms. This requirement is modelled in Table 5.9. The components of the dairy expansion scenario in terms of total receipts, total costs and net profit are presented in Table 5.8. The scenarios are as follows:

- Basic Scenario – New entrant dairy farmer owns all their land for the modelled 15 year period.
- Scenario A – New entrant dairy farmer leases in all their land for the modelled 15 year period.
- Scenario B – New entrant dairy farmer owns 35ha of land and leases in 23ha extra for the modelled 15 year period. These figures correspond with the amount of owned and rented land for Irish new entrant dairy farmers (McDonald, 2013b).
- Scenario C – New entrant dairy farmer owns 35ha of land and leases in 23ha extra for first 7 years of the modelled 15 year period. Farmer uses owned 35ha only for remaining 8 years of the scenario.
- Scenario D – New entrant dairy farmer owns 35ha of land and leases in 23ha extra for first 10 years of the modelled 15 year period. Farmer uses owned 35ha only for remaining 5 years of the scenario.

The Basic Scenario consists of the discounted net profit, receipts and costs realised by the new entrant farmer over a 15-year time period according to McDonald et al. These figures are based on the assumption that the farmer owns all the land he farms and therefore pays no rental costs. The farmer has average receipts of €4,424/ha per over the 15 year period and incurs average yearly costs of €3,746/ha. Discounted net profits are €678/ha per year over the 15 year timeframe.

The first alternative scenario (Scenario A) presented assumes that the new entrant farmer owns no land and must lease in all of the land on the 58ha farm. As a result, average yearly costs increase by €247/ha over the 15 year period, compared with the Basic Scenario. The increased costs cause a reduction in discounted yearly net profits to €431/ha, which represents a 36% reduction in profit compared to the Basic Scenario.

The second alternative scenario (Scenario B) models a new entrant dairy farmer who owns 35ha of land and leases in an extra 23ha for use on their dairy enterprise. These figures correspond to those in McDonald et al. (2013b) who surveyed new entrant dairy farmers and found the average new entrant owned 35ha of land and planned to rent in 23ha more when they converted to dairy farming. In this scenario, the requirement to rent in 23ha raises average costs €98/ha above the Basic Scenario, causing discounted net profits to fall to €580/ha per year. This represents a 14% fall in profitability compared with the Basic Scenario.

The third alternative scenario (Scenario C) builds on the Scenario B by modelling a situation where the new entrant farmer loses their lease on his rented 23ha of land after seven years and must farm on only their owned land of 35ha for the remaining eight years of the 15 year time period. An extension to this is examined in Scenario D where the farmer loses their lease after 10 years and farms their own land only for the five remaining years of the 15 year time frame. As shown in Table 5.9, total receipts fall in both scenarios compared to the Basic Scenario. Discounted yearly net profits are €455/ha when the lease is lost after seven years and €503/ha when the lease is lost after 10 years. Compared with the Basic Scenario, this corresponds with a 33% and 26% drop in profitability respectively.

Table 5.8 Components of Dairy Expansion Scenario

<i>Component</i>	<i>Description</i>
Average receipts	Average yearly farm income over the 15 year period, discounted yearly at rate of 5.5%
Average costs	Average yearly farm costs over the 15 year period, discounted yearly at rate of 5.5%
Net profit	Average farm net profit (receipts minus costs) over the 15 year period, discounted yearly at rate of 5.5%

**Table 5.9 Effect of Land Access on Dairy Expansion over 15 Year Period
(€/ha/year)**

<i>Scenario</i>	<i>Average receipts (€/ha/yr)</i>	<i>Average costs (€/ha/yr)</i>	<i>Net profit (€/ha/yr)</i>	<i>% Change in profit from baseline</i>
Basic Scenario	4,424	3,746	678	
Scenario A	4,424	3,993	431	-36%
Scenario B	4,424	3,844	580	-14%
Scenario C	4,267	3,810	455	-33%
Scenario D	4,341	3,838	503	-26%

Basic Scenario = All land owned; Scenario A = All land leased; Scenario B = 35ha owned, 28ha leased; Scenario C = 35ha owned, 23ha leased 7 years; Scenario D = 35ha owned, 23ha leased 10 years

5.7 CONCLUSIONS

With the removal of the dairy quota in 2015, land mobility is a key priority for policymakers. However, in the Irish context, the lack of land mobility remains an issue. As part of our examination of the factors affecting land mobility, this chapter asked are institutions to blame for this problem. The results show that while policy uncertainties may inhibit land mobility, the financial rewards available for those wishing to make their land available are substantial. In most cases, leasing out land on a long-term basis can be more profitable than farming for a wide selection of farmers. In all the examined scenarios, leasing out land and entitlements provides a better return for cattle finishing and tillage farmers than farming, a situation that persists even for higher earning cattle and tillage farmers.

Nevertheless, the role of policy as an inhibiting factor on land mobility should not be discounted. The difference in lease income observed between the Entitlements Sale and Active Farmer Scenarios shows policy change can pose a risk to future income. As a result, farmers may have some justification for maintaining control over land to ensure flexibility in the case of future policy change.

These results pose the question as to why these sorts of long-term land access arrangements are not more widely used by Irish farmers. One issue may be the size of the exemptions limits on tax free lease income. As the length of the lease increases, the amount of lease income that is free of income tax increases in turn. However, maximising the tax free exemptions requires the farmer to lease out unrealistically large amounts of land. Since less than 1% of Irish farms are greater than 100ha (CSO, 2012), there may only be a negligible amount of farmers with enough available land to maximise the tax exemptions. On the other hand, farms of less than 20ha make up 42%

of farms in the country (CSO, 2012). However, if these farmers leased out their land, the amounts involved would not be enough to make a significant impact for them in terms of tax relief. Additionally, the results from our sensitivity analysis shows that adjusting the tax exemption limits according to lease length does not change the percentage income differential between farming and leasing. Other aspects of the leasing regulations, such as the inability of those who lease their land to close relatives (e.g. son, daughter, siblings) to take advantage of the tax relief may also inhibit its usage.

Uncertainty in the area of subsidies may also inhibit land mobility. Policy uncertainty has been shown to adversely affect levels of agricultural investment (Lagerkvist, 2005; Heikkinen & Pietola, 2006; Lefebvre et al., 2012). A similar process may be at work here whereby future income via subsidy payments is at risk rather than investment capital. As shown in the Entitlements Sale and Active Farmer Scenarios, small rule changes in the area of subsidy policy can make a big difference in terms of farm income. On average, farmers who are forced to sell their entitlements before they expire are worse off over a seven year period than farmers who hold onto one hectare of land to remain eligible for entitlements under the new BPS. Rule changes such as these send out mixed signals to farmers, undercutting national policies promoting long-term land arrangements.

Certainty is also required from the point of view of land demand. In order to facilitate investment in land improvement, certainty in terms of the length of time land can be accessed is required. The results of the dairy expansion model show that renting in land can be a significant cost for expanding farmers, reducing profitability. However, farmers can offset this cost in the long-term by investing in the land to make it more productive, both agriculturally and financially. With the large capital cost of purchasing land, long-term leasing must play an important role in terms of meeting land demand. The dairy expansion model shows that it is possible to establish a profitable farm entirely on leased land. It should be stated that this is a static model and that reduction in available land may cause production to become more inefficient and reduce overall income. Further work is required on the dynamic effects of land availability.

However, leasing in land does contain a degree of risk. Farmers may not be able to renew the lease at the end of its term or the lease may be cut short unexpectedly. An

unanticipated loss of land access can be problematic for farmers, especially in the face of large capital repayments. Measures are required that can mitigate these risks for expanding farmers.

The leasing of entitlements is also an important issue going forward. Leasing out land without entitlements makes leasing far less attractive prospect in relation to farming. With the ability to rent out entitlements without leasing out land from 2016 onwards, as well as the need to use 100% of entitlements in one of every two years (DAFM, 2014), the market for leased entitlements should be more fluid in the future.

This is a static model, comparing incomes when prices and market conditions remain constant. Further work is required to look at how dynamic price and market conditions would affect the scenario results. One would expect a partial equilibrium effect where an increase in the number of farmers entering the market supplying land would cause lease prices to fall, reducing the returns available from leasing land.

This study uses farm income from a single year (2013) to simulate farm market income for dairy, tillage and cattle finishing farmers. One shortcoming of the study may be that using income from a single year fails to take into account the volatility of farm income from year to year. Looking at farm income from 2011 to 2013, tillage income averages €529/ha over the three year period, dairy farm income averages €1,092/ha while cattle finishing income averages €411/ha. This compares with the 2013 figures of €460/ha (tillage), €1,137 (dairy) and €389 (cattle finishing) used in this study. Using the averaged income figures, the seven year net income for tillage farmers is €130,011, for dairy farmers is €236,033 and for cattle finishers is €107,226.

Using the three year average income figures does not significantly change the study's results for dairy and cattle farmers who continue to be better off farming and leasing respectively across the three scenarios. Tillage farmers continue to be better off leasing in the Lease Scenario and Active Farmer Scenario but their increased income using three year average income means that there is now only a negligible difference between leasing and farming in the Entitlements Sale Scenario. Income volatility is an important issue for Irish farmers and should be accounted for when discussing farm incomes.

Local demand effects are also important in the Irish context. Land demand can be highly localised with particular fields or tracts of land being highly sought after due to

proximity, land quality or emotional reasons. As a result, land rental prices can be quite heterogeneous at a local level, with individual lease prices having the potential to be much higher than would be expected given average prices in an area. However, this may be an effect of the current thinness of the rental market and prices could become more homogenous with increased land supply.

We have shown that for many farmers, leasing out their land can be more profitable than farming the land themselves. Despite this fact, many farmers continue to farm while making a market loss (Hanrahan et al., 2014) when they could be earning substantially more through leasing. These results show that although institutional factors may influence land mobility, other factors must also be considered. Howley et al. (2014, 2015) highlight the potential importance of non-pecuniary benefits to farmers such as quality of life or the ability to be productive. Attitudinal issues may influence farmers' decisions on land use and land access as much as economic rationale (Willock et al, 1999a; Key & Roberts, 2009). Policymakers may need to pay greater attention to these attitudinal issues in order to facilitate greater land mobility in the future.

ANNEX 1

Table 5.10 High Farm Income vs. Lease Income, 2016-2022

	<i>Total Potential Farm Income 2016-2022</i>	<i>Total Lease Income 2016-2022</i>	<i>Net Lease Entitlement Income*</i>	<i>& Net Farm Income*</i>	<i>Difference Net Farm Income versus Net Lease Income</i>
Dairy	375	182	164	273	+109 (+67%)
Tillage	227	201	188	186	-2 (-0.1%)
Cattle	168	196	183	145	-38 (-21%)
Finisher					

* Income after deducting applicable PRSI, USC and applying relevant tax credits

Table 5.11 Low Farm Income vs. Lease Income, 2016-2022

	<i>Total Potential Farm Income 2016-2022</i>	<i>Total Lease Income 2016-2022</i>	<i>Net Lease Entitlement Income*</i>	<i>& Net Farm Income*</i>	<i>Difference Net Farm Income versus Net Lease Income</i>
Dairy	167	182	164	144	-19 (-12%)
Tillage	113	201	188	107	-81 (-43%)
Cattle	45	196	183	42	-141 (-77%)
Finisher					

* Income after deducting applicable PRSI, USC and applying relevant tax credits

Table 5.12 Farm Income vs. Lease Income, 2016-2020

	<i>Total Potential Farm Income 2016-2020</i>	<i>Total Lease Income 2016-2020</i>	<i>Net Lease Entitlement Income*</i>	<i>& Net Farm Income*</i>	<i>Difference Net Farm Income versus Net Lease Income</i>
Dairy	227	130	122	175	+53 (+44%)
Tillage	92	144	134	84	-50 (-37%)
Cattle	78	140	131	73	-57 (-44%)
Finisher					

* Income after deducting applicable PRSI, USC and applying relevant tax credits

Table 5.13 Farm Income vs. Lease Income, 2016-2025

	<i>Total Potential Farm Income 2016-2025</i>	<i>Total Lease Income 2016-2025</i>	<i>Net Lease Entitlement Income*</i>	<i>& Net Farm Income*</i>	<i>Difference Net Farm Income versus Net Lease Income</i>
Dairy	455	260	243	350	+107 (+44%)
Tillage	184	287	268	169	-100 (-37%)
Cattle	156	280	261	147	-118 (-45%)
Finisher					

* Income after deducting applicable PRSI, USC and applying relevant tax credits

Chapter 6. THE EFFECT OF FARMER ATTITUDES ON OPENNESS TO LAND MOBILITY

Given the financial rewards available for farmers willing to lease out their land shown in Chapter 5, the reasons for the lack of land mobility in Ireland require further investigation. Therefore, this chapter examines the role of attitudes in farmers' openness toward land transactions. This chapter is based on a nationally representative survey of Irish farmers across the major farm systems. Principal component factor analysis is used to derive attitudinal variables from an attitudinal question set. The results show that attitudinal factors are a significant predictor of openness to land mobility, both on the supply and demand side of the market. Additionally, there appears to be a greater demand amongst farmers for temporary land transactions such as land leasing arrangements than is currently seen in at market level.

6.1 INTRODUCTION

Land mobility is becoming an increasingly important issue for European agriculture. The enhanced market orientation of European agriculture and reduced reliance on subsidies requires farmers to be more efficient in their use of factors of production. This is coupled with European farmers getting older on average and the need amongst young European farmers for access to land (Davidova & Thomson, 2014; Zondag, 2015). Access issues are further complicated by the increasing land concentration in Europe, with more land being held by fewer farmers (Kay et al., 2015; van der Ploeg et al., 2015).

Agricultural land transactions in Europe occur within a range of national institutional and regulatory environments (Ciaian et al., 2010; Ciaian et al., 2012d; Ciaian et al., 2012e; Needham et al., 2011). One consequence of these diverse land governance frameworks is that land sales and land rental markets may operate uniquely from country to country. Despite an integrated agricultural market and the longstanding Common Agricultural Policy, the share of rented land varies between 20 and 80 per cent across the EU (Ciaian et al., 2010). Preference for land ownership over land rental or *vice versa* has been linked to capital market imperfections, farm profitability and government regulations (Swinnen et al., 2016).

At an EU policy level, tension exists between encouraging land mobility so as to enable the structural change required for farms to reach an economically viable size and protecting the family farming model, which accounts for 97 per cent of European farms (Davidova & Thomson, 2014; Hennessy, 2014). Enabling land to change hands but also maintaining local connections to rural areas requires a nuanced policy response. Individual member states have tried to balance these policy priorities by giving young, local farmers first refusal when land becomes available locally or by providing brokerage type services between young and retiring farmers (Ingram & Kirwan, 2011; Piet et al., 2012).

In this context, the abolition of the quota on milk production in 2015 presents an opportunity for deep structural change in European agriculture. The potential for farmers to adapt to a post-quota landscape will depend on many factors including demographics, socio-economic characteristics and the availability of inputs (Chevalier et al., 2012; Kempen et al., 2011). Land will be an input of particular importance, especially in an Irish context. Irish dairy farming mainly depends upon a grass-based rather than feed-based production system, meaning a sufficient supply of land is necessary in order to increase dairy production (Dillon et al., 2008; Läpple & Hennessy, 2012). However, Ireland suffers from very low levels of land mobility by European standards (Ciaian et al., 2010). This means that accessing extra land for the purposes of dairy farming may prove difficult. Additionally, the vast majority of rented land in Ireland is accessed through short-term, 11 month arrangements, unsuitable for the long-term infrastructural provisions that are required by dairy farmers (O'Neill & Hanrahan, 2012).

Irish land markets have traditionally been quite static, with land rarely changing hands. The dominant means of transfer of ownership is through non-market arrangements, usually inheritance, which is often attributed to the strong emotional attachment to land in Ireland (Donnelan et al., 2008). Rented land only accounts for 18% of utilisable agricultural area (UAA) in Ireland (Geoghegan & O'Donoghue, 2014). Farms are usually operated by the owner of the land. Due to the illiquid land market in Ireland, little information exists about what drives agricultural land transactions. This is especially true in relation to the supply of land. This study attempts to fill this

information gap by examining the attitudes of Irish farmers in relation to agricultural land mobility.

Given the lack of information regarding the characteristics of farmers who are participating in land markets, an *ex-ante* approach is proposed to determine which types of farmers are open to land transactions. Previous research has usually concentrated on the use of stated intentions surveys to accomplish this task (Breen et al., 2005; Lobley & Butler, 2010). However, given the static history of the Irish land market and relatively stable policy conditions, it is not anticipated that many Irish farmers outside the dairy sector intend to change their current land allocation. Therefore, a more exploratory analysis is required in order to identify farmers who would be open to land market participation.

This study therefore asks two main questions. Firstly, are farmers open to entering the land market? Generally speaking, farmers can either supply or demand land. This study will focus on farmers' openness to selling or leasing out land on the supply side and buying or leasing in land on the demand side. This contributes to the literature by quantifying land demand and supply in a context where market information is either missing or incomplete. Secondly, what distinguishes farmers who are open to entering the land market from those that are not? In addition to agronomic and socio-economic differences, do farmers interested in land transactions approach farming from a different attitudinal standpoint than farmers uninterested in land mobility? Answering these questions could provide policy makers with better information with which to design land mobility measures.

This chapter is structured as follows. Section 6.2 looks at the policy context of land mobility in greater detail, paying specific attention to the Irish situation. Section 6.3 deals with the methodology and data used in the study. Section 6.4 looks at the results of logistic regressions examining farmers' openness to entering the land market while Section 6.5 provides a discussion of the results and their impact on policy.

6.2 POLICY CONTEXT

Land mobility is an important aspect of the wider subject of agricultural structural change. Implicit in arguments for greater land mobility is the idea that land will pass from less efficient to more efficient farmers, thereby increasing efficiency in the

agricultural sector as a whole (Le Mouël, 2004). This efficiency can be expressed in economic terms but can also be characterised in an increased focus on environmental and landscape sustainability amongst young farmers compared to their older counterparts (Morris & Potter, 1995; van Passel et al., 2007). In policy terms, the push for greater land mobility has mainly been expressed through initiatives designed to allow young farmers access to land, through either encouraging retirement or incentivising transfer to a young farmer (Zagata & Sutherland, 2015). Such initiatives have been found to have limited impact in terms of meeting policy objectives. A deadweight loss can occur as farmers may bring forward a retirement that would have occurred in any case (Bika, 2007; Davis et al., 2009). Such schemes may also enable older farmers to lease out land to take advantage of pension provisions and then reclaim the land once said pension is paid (Mazorra, 2000).

Much of the literature regarding land mobility and structural change focuses on the succession and inheritance framework, which is the method by which land most frequently changes hands (Inwood & Sharp, 2012; Johnsen, 2004; Lobley et al., 2012). Land mobility outside of intra-family transfer is dependent upon land rental and sales markets. The structure and operation of these markets in European countries often arise from historical and institutional forces (Swinnen, 2002). Land market regulations have often led to perverse effects, encouraging either land rental or land ownership to dominate in specific countries. Such an effect was seen in Ireland where a tenant-based agricultural system was replaced by one dominated by owner occupancy following legislative and regulatory changes in the 19th and 20th centuries.

A lack of land mobility has long been seen as an impediment to structural change in Irish agriculture (Commins, 2001; Inter-Departmental Committee on Land Structure Reform, 1978; Maguire, 1983). Studies concerning land mobility in Ireland have mostly focused on the succession and inheritance aspect of land transfer (Hennessy & Rehman, 2007; Kennedy, 1991). It has been found that policy instruments incentivising either the early retirement of older farmers or the installation of younger farmers on farms have had limited success in increasing the level of land mobility (Bika, 2007; Gillmor, 1999). Land mobility studies in Ireland outside the prism of succession and inheritance have been relatively rare. Conway (1986) studied land leasing practices in the west of Ireland and found that although potential lessees were willing to pay more for land than the

prevailing rate, potential lessors were generally not interested in leasing out land as long as they were able to continue farming the land themselves. Jenkins (1997) found in a study of leasing activity in the south-east of Ireland that commercial tillage and non-local farmers were predominant in the rental market, with land being supplied by older farmers operating smaller farms.

Bogue (2013) found that three-quarters of farmers with no successor would consider renting out land on either a long or short-term basis when they themselves were no longer able to farm at their current level. This compared with 28% of farmers who would consider selling their land in the same situation. Banovic et al. (2015) found general support for policy measures incentivising land mobility amongst Irish farmers but also found that surveyed farmers were reluctant to take advantage of the policy measures themselves. The lack of studies examining land mobility outside the framework of familial land transfers is particularly glaring given that one of the main planks of Irish land mobility policy, tax relief on long-term land leasing, doesn't apply to family members.

Due to the low number of transactions in Irish land markets, as well as the lack of literature in the area, little information exists about the characteristics and attitudes of Irish farmers who enter the land market. Therefore, this study includes a wide range of factors which may drive willingness to enter the land market. As well as structural and socio-economic factors, farmer attitudes are considered. This fits with what has been called the behavioural approach to investigating the actions of individual farmers. The behavioural approach has been defined as focusing on the motives, values and attitudes that determine the decision-making processes of individual farmers (Morris & Potter, 1995). Behavioural approaches in agricultural studies are those that (a) seek to understand the behaviour of individual decision makers, usually the farmers or land managers directly responsible for the land; (b) focus on psychological constructs such as attitudes, values, and goals but also commonly gather additional relevant data on farm structure, economic situation, successional status, etc.; and (c) employ largely quantitative methodologies, in particular psychometric scales such as Likert-type scaling procedures for investigating psychological constructs (Morris & Potter, 1995, Burton, 2004). In general, such approaches view behaviour as a combination of motivational factors and structural/economic elements that constrain, facilitate and, at

the same time, reflect the motivational preferences of the farmer (Gasson & Potter, 1988; Shucksmith, 1993).

Attitudes have been defined by Willock et al. (1999a) as a positive or negative response towards an attitude-object where an attitude-object may be a person, idea, concept or physical object. Attitudes are formed by what an individual perceives to be true about the attitude-object. Eagly and Chakien (1993) define an attitude as a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. Farmer behaviour has been shown to be affected by a multiplicity of farming goals and attitudes (Willock et al., 1999a). The relationship among people's attitudes, goals and behaviours is often modelled in the literature through theoretical constructs such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991; Eagly & Chaiken, 1993). The TRA argues that behaviour is best predicted by a person's intentions, which are in turn affected by their attitudes and the influences of significant others on their intention to act. The TPB expands on the TRA construct by adding perceived behavioural control to the model, which measures the extent to which people believe they are able to control an outcome (Burton, 2004).

There is a large literature on the attitudes and objectives of farmers and the impact of these on farming behaviour with farming attitudes being identified as important to risk aversion, innovation, diversification, off-farm work, environment, production, management, legislation, stress, pessimism and satisfaction toward farming (Willock, 1999b provides a review of the literature). Studies related to attitudes of farmers toward land have tended to focus on land use, especially in terms of environmental issues (Mills et al., 2013; Wilson, 1996). Given the absence of information about farmers in the Irish land market, these factors will provide a sense of what drives farmers in their consideration of land transactions.

6.3 METHODOLOGY AND DATA

This chapter's analysis of farmer attitudes to land mobility is based on a survey of 846 Irish farmers in 2014 and 2015. The survey used quota controlled sampling to survey a representative number of farmers from across the country. The respondents were asked questions based on three main dimensions: current farm characteristics; attitudes to

land, farming and future plans; and knowledge about land-based policy initiatives. The survey also contained 15 attitudinal questions using a four-level Likert-type scale ranging from “strongly disagree” to “strongly agree”. The respondents could also choose a “don’t know” option. There is little consensus regarding the correct number of response options or whether an odd number of response options should be used in order to allow a neutral, midpoint response (Sturgis et al., 2014). In the context of this study, it has been found that 4-point scales (as used here) yield similar levels of reliability compared to 5-point scales which would contain a midpoint (Alwin, 2007). Neutral, midpoint responses can also represent hidden “don’t know” answers (Sturgis et al., 2014). Therefore, it was decided to use a 4-point scale with an additional “don’t know” option. The attitudinal statements drew on previous work examining Irish farmers’ attitudes toward farming decisions (Howley & Dillon, 2012; Howley et al., 2015), as well as input from experts. The attitudinal statements are listed in Table 6.1.

Principal component factor analysis (PCA) is used to identify underlying structural relationships between the attitudinal variables. PCA finds the linear combination that explains the maximum amount of variance among the observed variables called the “first principal component”. It also finds another, orthogonal (uncorrelated) linear combination that explains the maximum amount of remaining variance (“second principal component”), and so on until all variance is explained (Hamilton, 2013). PCA thus serves as a data reduction technique, allowing the analysis of the attitudinal statements to be simplified. Each principal component has an eigenvalue, which represents the standardised variance explained by the component. Principal components with values of less than one eigenvalue explain less than the equivalent of one variable’s variance so are set aside for purpose of analysis (Abdi & Williams, 2010).

Table 6.1 Mean Scores and Percentage Agreement with Attitudinal Statements

	<i>Mean scores</i>	<i>Percentage completely agreeing</i>
It is important not to leave farm land idle	4.50	55.4
It is important for me to pass on my land in as good a shape or better than I received it	4.46	53.4
I enjoy farming much more than I would other potential sources of employment	4.32	48.1
Farming is a more rewarding job in terms of quality of life, independence and lifestyle than it is in terms of money	4.20	44.6
It is important not to be afraid of adopting new farming practices	4.15	32.4
I have to keep my farm running to ensure I have something to pass on to my children/next generation	4.12	42.1
To be successful in farming it is important for me to adapt and use new technologies (whether agri or non-agri technologies)	4.10	33.5
It is important to visit other farms to look at their methods	4.03	36.2
I don't think it is a good idea to take too many risks when it comes to farming	4.00	30.5
It is important for me to be respected by other farmers	3.99	30.6
I am good at finding different types of information to help me run my business	3.97	28.5
Agricultural land in Ireland is under-utilised	3.48	20.2
I am cautious about adopting new ideas and farm practices	3.37	16.6
My economic future on this present farm is bright	3.36	16.9
It makes more sense for me to join an agricultural scheme if my neighbours are also joining	3.12	17.4

Following the PCA, varimax orthogonal rotation was used to further simplify the factor structure. Four principal components with eigenvalues above one were generated by the PCA and rotation process, representing different attitudes toward farming among the respondents. These attitudes are related to the importance of innovation in farming, optimism about the future of agriculture, the non-economic benefits of farm work and conservatism regarding the farm business. Although there are some differences between the attitudinal statements used in this study and those used by Howley and Dillon (2012) and Howley et al. (2015), the attitudinal groupings derived here are similar to those found in those two studies. The 'Pleasure of Farming' orientation found in this study corresponds to the 'Farming Value' and 'Lifestyle' orientations in Howley et al. (2015), and Howley and Dillon (2012) respectively. Similarities can also be found between this study's 'Innovative' orientation and Howley and Dillon's 'Pursuit of Innovation' orientation. The 'Agri-Optimistic' orientation can also be compared to Howley et al.'s 'Profit' orientation. A description of the attitudinal variables is available in Table 6.2. The factor loadings for each attitudinal statement onto the four principal components can be found in Table 6.3.

Table 6.2 Description of Attitudinal Variables

<i>Attitudinal variable</i>	<i>Description</i>
Innovative orientation	Farmers with a high ranking in this variable acknowledge the importance of technology and new ideas with regard to farming. They agree strongly with statements such as “It is important not to be afraid of adopting new farming practices” and “I am good at finding different types of information to help me run my business”.
Pleasure of farming orientation	Farmers with a high ranking in this variable emphasise the non-economic benefits of farming, especially compared to non-farming employment. They are also concerned with their farming legacy. They agree strongly with statements such as “Farming is a more rewarding job in terms of quality of life, independence and lifestyle than it is in terms of money” and “It is important for me to pass on my land in as good a shape or better than I received it”.
Conservative orientation	Farmers with a high ranking in this variable prefer to rely on traditional farming practices and dislike change. They agree strongly with statements such as “I don’t think it is a good idea to take too many risks when it comes to farming” and “I am cautious about adopting new ideas and farming practices”.
Agri-optimistic orientation	Farmers with a high ranking in this variable are optimistic about the future of agriculture and enjoy being farmers. They agree strongly with statements such as “My economic future on this present farm is bright” and “I enjoy farming much more than other potential sources of employment”.

The attitudinal orientations found here can be compared with similar groupings in the literature. The ‘Innovative’ orientation has been found amongst farmers by Barnes and Toma (2012) in their survey of Scottish dairy farmers, as well as Boer’s (2013) study of entrepreneurship amongst Rwandan farmers. The ‘Conservative’ orientation has been reported amongst farmers by Kelly et al. (2015) in their study of technology acceptance amongst Irish dairy farmers and by Bernier et al. (2015) in their study of climate-smart agricultural practices amongst Kenyan farmers. The ‘Agri-Optimistic’ factor has been noted amongst Filipino farmers by Padilla-Fernandez and Nuthall (2001), and organic fruit and vegetable farmers in India (Nandi et al., 2015). The ‘Pleasure of Farming’ orientation has been found amongst farmers in studies such as Bergvoet et al. (2004) in their examination of the entrepreneurial behaviour of Dutch dairy farmers and Walter’s (1997) study of how Illinois farmers define success.

Table 6.3 Factor Loadings of Attitudinal Statements

<i>Statement</i>	<i>Pleasure of farming</i>	<i>Innovative</i>	<i>Agri-optimistic</i>	<i>Conservative</i>
Agricultural land in Ireland is under-utilised	0.1666	0.3447	0.2091	0.0107
I enjoy farming much more than I would other potential sources of employment	0.4027	0.0196	0.5615	0.0332
I am good at finding different types of information to help me run my business	0.1075	0.4731	0.5335	0.0634
My economic future on this present farm is bright	0.0619	0.285	0.662	0.0321
To be successful in farming it is important for me to adapt and use new technologies (whether agri or non-agri technologies)	0.1398	0.5872	0.2708	0.036
I have to keep my farm running to ensure I have something to pass on to my children/next generation	0.5969	0.2275	0.2029	0.0479
I am cautious about adopting new ideas and farm practices	0.0407	0.0712	0.1231	0.7262
It is important for me to be respected by other farmers	0.0744	0.2416	0.3484	0.5341
It makes more sense for me to join an agricultural scheme if my neighbours are also joining	0.0508	0.2087	0.4206	0.4901
Farming is a more rewarding job in terms of quality of life, independence and lifestyle than it is in terms of money	0.5927	-0.119	0.3865	0.0128
It is important for me to pass on my land in as good a shape or better than I received it	0.6827	0.2444	0.1274	0.0055
It is important to visit other farms to look at their methods	0.1252	0.7124	0.1445	0.1457
It is important not to be afraid of adopting new farming practices	0.1569	0.7693	0.0685	0.0285
It is important not to leave farm land idle	0.6557	0.3514	0.0997	0.0135
I don't think it is a good idea to take too many risks when it comes to farming	0.2029	0.0144	0.1156	0.6099
Initial eigenvalues	2.29	2.23	1.73	1.55

Values greater than 0.3 highlighted in bold.

Respondents were asked about their openness to four forms of land transaction:

- Land purchase;
- Land sale;
- Land lease in;
- Land lease out.

Respondents replied either “Yes” or “No” in terms of their willingness to engage in each form of transaction. Of the 846 farmers surveyed, 47% were willing to buy land, while 26% were willing to sell. In terms of leasing, 51% were willing to lease in land, while 29% were willing to lease out land. Table 6.4 details the mean values for each attitudinal orientation if the respondent answers that they are willing to engage in that transaction. A logistic regression model is used to examine the probability of a farmer

being open to each land transaction. The dependent variable is the willingness to engage in the land transaction (purchase land, sell land, lease land in, lease land out). The independent variables are the attitudinal factors described above, soil type, farm size, stocking rate, farm system, age, children, presence of a successor, future production plans, farm income per hectare, percentage of household income from farming and the presence of an off-farm job (see Table 6.5).

Table 6.4 Mean Values for Attitudinal Orientations

<i>Attitudinal variable</i>	<i>Lease In</i>	<i>Lease Out</i>	<i>Buy</i>	<i>Sell</i>	<i>Mean</i>
Innovative orientation	0.18	0.12	0.15	0.12	0
Pleasure of farming orientation	0.05	-0.07	0.09	-0.20	0
Agri-optimistic orientation	0.12	-0.14	0.13	-0.14	0
Conservative orientation	-0.19	0.05	-0.16	-0.05	0

Table 6.5 Independent Variables of Land Mobility Model

<i>Variable</i>	<i>Description</i>	<i>Mean</i>	<i>Standard Deviation</i>
Innovative orientation (Innovative)	Factor variable measuring degree to which farmer feels technology and new ideas are important.	0	1
Pleasure of farming orientation (Pleasure of Farming)	Factor variable measuring degree to which farmer enjoys farming as opposed to other occupations.	0	1
Agri-optimistic orientation (Agri Optimistic)	Factor variable measuring degree to which farmer feels optimistic about the future of their farm.	0	1
Conservative orientation (Conservative)	Factor variable measuring degree to which farmer is cautious about risk-taking and new ideas.	0	1
Farm Size	1 - <10 ha, 2 – 10-19 ha, 3 – 20-49 ha, 4 – 50-74 ha, 5 - 75–99 ha, 6 – 100-149 ha, 7 – 150+ ha	3.22	1.27
Increase Future Production	1 – aim to increase production over the next five years, 0 – maintain current levels of production	0.17	0.38
Decrease Future Production	1 – aim to decrease production over the next five years, 0 – maintain current levels of production	0.09	0.28
Diversify Future Production	1 – aim to increase diversification over the next five years, 0 – maintain current levels of production	0.09	0.28
Stocking Rate	Number of livestock units (LUs) per hectare	1.5	1.76
Farm System	1 – dairy, 2 – cattle rearing, 3 – cattle other, 4 – tillage, 5 – sheep, 6 - mixed enterprise	N/A	N/A
Age	1 - <35 years, 2 – 35-44 years, 3 – 45-50 years, 4 – 51-64 years, 5 – 65+ years	3.61	1.96
Children	1 – has children, 0 – no children	0.71	0.45
Successor	1 – has identified successor, 0 – no successor identified	0.43	0.50
Household Income from Farming	1 – 0-25%, 2 – 26-50%, 3 – 51-75%, 4 – 76-100%	2.84	1.74
Off-farm Job	1 – farmer has an off-farm job, 0 –farmer does not have an off-farm job	0.33	0.47
Agri-Optimistic*Increase Future Production	Interaction variable interacting the Agri-optimistic orientation variable and a variable representing intention to increase production	N/A	N/A
Conservative*Household Income from Farming ≥76%	Interaction variable interacting the Conservative orientation variable and a variable representing farmers who derive between 76 and 100% of household income from farming	N/A	N/A
Agri-optimistic*Age<35	Interaction variable interacting the Agri-optimistic orientation variable and a variable representing farmers aged 35 and younger	N/A	N/A
Innovative*Cattle Farmer	Interaction variable interacting the Innovative orientation variable and a variable representing cattle farmers	N/A	N/A
Innovative*Diversify Future Production	Interaction variable interacting the Innovative orientation variable and a variable representing intention to diversify production	N/A	N/A

6.4 MODEL

This study uses a logistic regression or logit model to examine willingness to enter into a land transaction. The logistic regression is an example of a binary response model, in which interest lies primarily in the response probability

$$P(y = 1|\mathbf{x}) = P(y = 1|x_1, x_2, \dots, x_k), \quad (21)$$

where \mathbf{x} is used to denote the full set of explanatory variables. The binary response model can be specified as

$$P(y = 1|\mathbf{x}) = G(\beta_0 + \beta_1x_1 + \dots + \beta_kx_k) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}), \quad (22)$$

where G is a function taking on values strictly between zero and one, $0 < G(z) < 1$, for all real number z . this ensures that the estimated response probabilities are strictly between zero and one. The notation $\mathbf{x}\boldsymbol{\beta} = \beta_1x_1 + \dots + \beta_kx_k$.

In the logit model, G is the logistic function

$$G(z) = \frac{\exp(z)}{[1 + \exp(z)]} \quad (23)$$

which is between zero and one for all real numbers z . This is the cumulative distribution function for a standard logistic random variable (Wooldridge, 2013).

The logit model used in subsequent analysis can be written as

$$\begin{aligned} P(\textit{openness to land transaction} = 1|\mathbf{x}) = \\ G(\beta_0 + \beta_1x_1 + \dots + \beta_kx_k) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}), \end{aligned} \quad (24)$$

where \mathbf{x} is the explanatory variables listed in Table 6.5 and $\boldsymbol{\beta}$ is the estimated coefficients associated with those variables.

One difficulty with interpreting non-linear models such as the logit is that unlike linear models, an explanatory variable's coefficient does not equal its marginal effect. A given change in x will usually have less effect when $P(y = 1|x)$ is near the extreme values of zero or one as compared with middle values. Therefore, this study uses odds ratios to interpret the marginal effects of the explanatory variables. Odds ratios in logit models can be interpreted as the effect of a one unit change in x in the predicted odds ratio with

the other variables in the model held constant. The odds of $P(y = 1|x)$ increase multiplicatively by e^β for a one unit increase in x , holding all other variables constant.

6.5 RESULTS

Four logistic regression models were created using the available data. The dependent variable modelled in each case was willingness to engage in the stated land transaction. Two models analysed farmers' attitudes to the leasing land. 418 farmers were open to leasing in land while 247 farmers were willing to lease out land. The results from these two models are presented in Table 6.6. Two models analysed farmers' attitude to permanent land transactions. 450 farmers were open to buying land while 218 farmers were willing to sell land. The results from these two models are presented in Table 6.7.

Table 6.6 Factors Related to the Probability Farmers are Open to Leasing Land

<i>Lease Out</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>Odds Ratio</i>	<i>Lease In</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>Odds Ratio</i>
Innovative	0.30***	0.09	1.35		0.14*	0.09	1.15
Pleasure of Farming	-0.16*	0.09	0.85		0.15*	0.08	1.16
Conservative	0.07	0.11	1.07		-0.26***	0.08	0.77
Agri-Optimistic	-0.05	0.09	0.96		0.19**	0.08	1.21
Good Soil	0.44	0.34	1.55		-0.48*	0.30	0.62
Medium Soil	0.69**	0.34	1.99		-0.39	0.30	0.68
Cattle Rearing	0.71***	0.24	2.04				
Cattle Other	0.56***	0.19	1.75				
Dairy					0.33	0.22	1.39
Farm Size <10ha	-0.43	0.52	0.65				
Farm Size 10-19ha	-0.32	0.42	0.73		0.53	0.41	1.69
Farm Size 20-49ha	-0.73*	0.39	0.48		0.75**	0.40	2.12
Farm Size 50-74ha	-0.41	0.42	0.66		0.94**	0.43	2.56
Farm Size 75-99ha	-0.90*	0.47	0.41		1.00**	0.48	2.72
Farm Size 100-149ha					0.80	0.54	2.24
Farm Size >150ha	-0.60	0.69	0.38		1.63**	0.68	5.09
Stocking Rate	-0.02	0.05	0.98		0.31***	0.08	1.37
Age 35-44	1.13**	0.48	2.38		-0.77**	0.40	0.46
Age 45-50	0.84*	0.50	2.32		-1.04***	0.41	0.35
Age 51-64	1.19**	0.46	3.30		-0.78**	0.38	0.46
Age >65	1.40***	0.48	4.04		-1.37***	0.41	0.25
Children	0.16	0.20	1.17		0.41**	0.19	1.51
Successor	-0.42**	0.18	0.66		-0.35**	0.17	0.70
Increase Future Production	-0.21	0.24	0.81		0.90***	0.23	2.45
Decrease Future Production	0.82***	0.28	2.27		-0.56*	0.31	0.57
Off-Farm Job	-0.15	0.21	0.86		0.41**	0.21	1.51
Household Income from Farming ≤ 25%	-0.46*	0.28	0.63				
Household Income from Farming 26-50%	-0.63**	0.26	0.53		-0.59**	0.25	0.56

Household Income from Farming 51-75%				-0.72**	0.28	0.49
Household Income from Farming \geq 76%	-0.57**	0.24	0.57	-0.38	0.28	0.68
Agri-Optimistic*Increase Future Production	-0.61**	0.27	0.55			
Conservative*Household Income from Farming \geq 76%	-0.28*	0.17	0.76			
Pleasure of Farming*Farm Size <10ha	0.47	0.30	1.60			
Constant	-1.72**	0.67	0.36	0.07	0.6	1.07
<i>Model summary</i>						
Log-likelihood	-466.7185			-490.2886		
Pseudo R2	0.0865			0.1638		
AIC	955.4371			1036.577		
BIC	1142.393			1169.312		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 6.7 Factors Related to the Probability Farmers are Open to Selling/Buying Land

<i>Sell Land</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>Odds Ratio</i>	<i>Buy Land</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>Odds Ratio</i>
Innovative	0.27**	0.13	1.31		0.05	0.09	1.05
Pleasure of Farming	-0.24***	0.08	0.79		0.25***	0.08	1.29
Conservative	-0.04	0.09	0.96		-0.23**	0.08	0.80
Agri-Optimistic	-0.15*	0.09	0.86		0.16*	0.08	1.17
Good Soil	-0.02	0.32	0.98		0.05	0.30	1.05
Medium Soil	0.26	0.32	1.30		0.15	0.31	1.16
Mixed	-1.48**	0.57	0.23				
Cattle Rearing	0.16	0.25	1.17				
Cattle Other	0.25	0.19	1.28				
Dairy					0.45**	0.22	1.57
Farm Size <10ha	-0.90*	0.54	0.41				
Farm Size 10-19ha	-0.76*	0.44	0.47		0.75*	0.43	2.13
Farm Size 20-49ha	-0.59	0.40	0.56		1.28***	0.42	3.60
Farm Size 50-74ha	-0.41	0.42	0.66		1.38***	0.45	3.98
Farm Size 75-99ha	-0.32	0.46	0.72		1.84***	0.50	6.32
Farm Size 100-149ha					1.47**	0.56	4.33
Farm Size >150ha	-1.44*	0.85	0.24		2.52***	0.75	12.38
Stocking Rate	0.06	0.05	1.06		0.17**	0.07	1.19
Age <35	-0.85*	0.43	0.43		1.56***	0.42	4.74
Age 35-44	-0.26	0.29	0.77		0.95***	0.28	2.59
Age 45-50					0.78**	0.28	2.18
Age 51-64	-0.55**	0.25	0.58		0.45**	0.20	1.57
Age >65	-0.71**	0.29	0.49				
Children	0.15	0.21	1.17		0.58***	0.20	1.79
Successor	-0.46**	0.18	0.63		0.30*	0.17	1.34
Increase Future Production	0.10	0.23	1.11		0.82***	0.25	2.27
Decrease Future Production	0.62**	0.30	1.85		-0.44	0.31	0.64

Diversify Future Production				0.51*	0.30	1.67
Off-Farm Job	-0.13	0.21	0.88	0.53**	0.21	1.70
Household Income from Farming \leq 25%	0.29	0.29	1.34	0.12	0.28	1.12
Household Income from Farming 26-50%	0.44*	0.25	1.55	-0.10	0.24	0.91
Household Income from Farming 51-75%	0.35	0.25	1.43	-0.02	0.24	0.98
Innovative *Cattle Farmer	-0.28	0.17	0.76			
Innovative*Diversify Future Production				-0.40	0.38	0.67
Constant	-0.45	0.54	0.64	-2.87***	0.56	0.06
<i>Model summary</i>						
Log-likelihood	-447.8185			-484.9811		
Pseudo R2	0.0723			0.1705		
AIC	955.637			1027.962		
BIC	1097.853			1165.437		

Note: *** p<0.01, ** p<0.05, * p<0.1

Model Specification

The final specifications of the regression models are shown in Tables 6.6 and 6.7. However, these models went through various iterations before arriving at the final versions. Firstly, independent variables were chosen based on theory, existing literature and expert opinion. Some variables were converted from continuous variables into dummies, e.g. farm size and age, in order to examine whether differential effects could be found across the distribution of these variables. Some explanatory variables were omitted from analysis e.g. agricultural education and some system dummies, as they did not contribute significantly to the model and in the case of the system dummies, made the results easier to interpret. Interaction terms were added to the models in order to further clarify the relationships between the explanatory and dependent variables. Models were first estimated with these variables entered on an individual basis and subsequently with the addition of an interaction term. Interaction terms that meaningfully increased the explanatory power of the model were included in the final specification. The models found in Tables 6.6 and 6.7 yielded the greatest explanatory power of all the tested specifications using the pseudo *R*-squared statistic, log-likelihood, AIC and BIC Criteria.

Attitudinal Variables

The attitudinal variables derived from the PCA analysis were found to have a statistically significant impact on a farmer's willingness to enter the land market. The attitudinal orientation 'Innovative' had a positive impact on a farmer's willingness to supply land. For every one unit increase in the orientation, the probability of leasing out land increases by a factor of 1.35 and of selling land by a factor of 1.31. Conversely, the 'Pleasure of Farming' variable had a negative impact on willingness to sell and lease out land. Additionally, it is positively correlated with a willingness to buy and lease in land. The 'Conservative' orientation had a negative effect on the willingness to buy and lease in land while the 'Agri-Optimistic' orientation was positively related to leasing in and buying land while negatively related to selling land.

Agronomic variables

Of the farm system variables employed in the analysis, cattle rearing, cattle other, mixed and dairy enterprises proved significant predictors of willingness to enter the land market. In the 'Lease Out' regression, cattle rearing and cattle other farmers were significantly more willing to lease out land compared to the reference category of all other farm systems. The probability of being willing to lease out land is increased by a factor of 2.04 for cattle rearing farmers and 1.75 for cattle other farmers, compared with all other farming systems. Numerous interaction terms were used in order to further explain the positive relationship between cattle rearing and cattle other farmers and willingness to lease out. These interaction terms combined cattle farming with age dummies, farm income share dummies, soil dummies, presence of a successor, and future farm plans. No interaction term proved to be significant and the cattle rearing and cattle other variables remained significant throughout. Farm system was not a significant predictor of leasing in land. Mixed farmers were significantly less willing to sell land than other farmers, while dairy farmers were significantly more likely to want to buy land than all other farm types.

In general, significant effects for farm size were limited to either very small or very large farms. Small farms were the least likely to demand land compared with all other farm size categories. Farms less than 10 hectares had a significant negative correlation with both leasing in and buying land. Farms of over 150 hectares were most likely to demand land. The smallest and largest farm size categories were significantly less likely to be willing to supply land than the reference category.

Stocking rate was a significant predictor of land demand. In terms of leasing in land, an increase of one LU/ha increased the probability of being willing to lease in land by a factor 1.37. An increase of one LU/ha increased the probability of the farmer being open to buying land by a factor of 1.19.

Soil quality was also included as an explanatory variable in each regression model. Three soil categories were used: good, medium and poor. The good and medium categories were included as dummy variables, with poor quality soil acting as the reference category. Soil quality was a significant explainer of willingness to enter the land market in the 'Lease Out' model, with farmers on medium quality soil being

significantly more open to leasing out land than those in the reference category. Farmers with good land were significantly less likely to want to lease in land than those on poor soils.

Demographic Variables

Age effects relating to willingness to enter the land market can be seen amongst the youngest and oldest categories of farmers. The youngest category of farmers (those under the age of 35) was significantly more willing to lease in and buy land compared to older farmers. Additionally, the youngest farmers were significantly less willing to lease out land. Farmers in the oldest age category (65 years and older) were significantly less likely to demand land either through leasing or purchase. Farmers in the 45-50 years were more likely to be willing to sell land than any other age category.

The presence of a farm successor was a significant explanatory variable in all four models. Having a successor made farmers significantly less likely to be willing to lease out or sell land, compared with farmers without a successor. Having a successor decreased the likelihood of being willing to lease out land by a factor of 0.66 and sell land by a factor of 0.63, compared to farmers without a successor. Interestingly, farmers with a successor were more likely to be willing to buy land but significantly less likely to be willing to lease in land than those without a successor.

Farmers with children were significantly more willing to demand land than farmers without children. Farmers with children were more likely to be willing to lease in land by a factor 1.51 and more likely to be willing to buy land by a factor of 1.79, compared with farmers without children. All models were also run with only the successor or children variables included to exclude the possibility of multicollinearity affecting the results. In all four models, estimates were not significantly affected by including either the successor or children variables individually, with all signs and levels of significance remaining the same.

Financial Variables

Farmers were asked what percentage of household income is made up of farm income. Responses were divided into four categories: 0-25%, 26-50%, 51-75% and 76-100% of household income coming from farm income. Compared to the reference category of

farmers for whom 51-75% of household income came from their farm, all other farmers were significantly less likely to lease out land. Farmers in the 26-50% farm income category were more likely by a factor of 1.55 to be open to selling land than those who rely on farm revenues for over 75% of household income. Farmers with an off-farm job were significantly more likely to lease in and buy land than farmers without off-farm employment. Farmers with off-farm jobs were more likely by a factor of 1.51 to be open to leasing in land and by a factor of 1.7 to buying land than those without off-farm jobs.

The future plans of the farmer regarding the farm were also a significant explanatory variable. Future plans were defined as plans for the next five years. The reference category was planning to make no significant change to production in the next five years. Farmers who planned to increase production were more likely to be open to leasing in and buying land while farmers who were planning to decrease production were willing to lease out and sell land. Farmers planning to diversify their production were more likely to buy land than those planning no change.

Interaction Terms

A number of interaction terms were also added to the model in order to further investigate the influence of the attitudinal variables. Firstly, the ‘Agri-Optimistic’ attitudinal variable is interacted with the variable representing the farmer’s intention to expand in the next five years. These variables were interacted in order to determine the extent to which farmers’ expansion plans and levels of agri-optimism were related. The interaction term was significant at the 5% level while neither variable was individually significant. Odds-ratios are used to interpret the interaction terms (Buis, 2010). For farmers intending to expand, a one unit increase in agri-optimism decreases the likelihood of leasing out land by 0.55. It can also be said that agri-optimism only significantly affects farmers’ willingness to lease out land if those farmers plan to expand.

The ‘Conservative’ attitudinal variable was interacted with the variable representing farmers for whom farming provided between 76 and 100% of household income. These variables were interacted to examine the relationship being heavily dependent on farm income and levels of conservatism. For the farmers who are heavily dependent on farm income, a one unit increase in conservatism decreases the likelihood of leasing out land

by a factor of 0.76. The variable representing heavy dependence on farm income is significant in both the presence and absence of the interaction term. This means that when the 'Conservative' variable is at zero (its mean), being heavily dependent on farm income still decreases the likelihood of being open to leasing out land. Interaction terms were also developed combining the 'Pleasure of Farming' attribute with the smallest farm size category, the 'Innovate' attribute with being a cattle farmer, and the 'Innovative' attribute with diversifying future production. These interaction terms did not add significantly to the model.

6.6 DISCUSSION

This study examined the extent to which Irish farmers would be willing to enter the agricultural land market. The aim of the study was to explore Irish farmers' attitudes towards land mobility and to build a profile of farmers who would be open to engaging in land transactions. The results show that about half of farmers in the sample are open to buying or leasing in land while about a quarter of farmers sampled are open to selling or leasing out land. The results also show distinct profiles emerging for farmers demanding land, through either leasing in or purchase and farmers open to supplying land, whether through leasing out or sale.

Farmers demanding land are more likely to have a high ranking on the 'Pleasure of Farming' and 'Agri-Optimistic' attitudinal orientations and a low ranking on the 'Conservative' orientation. They are also more likely to have children, be planning to increase farming activity in the next five years and have an off-farm job. They are more likely to be under 35 years of age and have a high stocking rate. They are less likely to have farms of less than 10 hectares and be over 65 years of age.

Farmers open to supplying land are more likely to rank high on the 'Innovative' orientation and rank low on the 'Pleasure of Farming' orientation. They are more likely to be intent on decreasing farming production in the next five years and are less likely to have a successor. They are also more likely to be only somewhat dependant on farm income, receiving greater than 25% but less than 75% of total household income from farming.

Farmers ranking high in the 'Pleasure of Farming' orientation value the lifestyle benefits of farming over any pecuniary benefits associated with the profession. Farmers

have been found to have a multiplicity of motivations for why they farm, many of which are non-economic in nature (Howley et al., 2015; Key & Roberts, 2009). For these farmers, land may not be seen as an economic resource but as a source of utility in and of itself. Therefore, it is not surprising that farmers with a high ranking in this orientation are opposed to releasing land and are open to increasing their land stock.

The finding that farmers with a high ranking in the 'Innovative' orientation are more open to supplying land, both through leasing and sale, suggests that these farmers are less constrained by traditions of keeping land 'in the family name'. They may see land as just another input in the agricultural production process. Innovative farmers in the Irish context may also be thought about as generating new combinations of existing resources (Bender & Laestadius, 2005).

The positive effect of having children and having a designated successor on willingness to buy land (and lease in land for the 'Children' variable) fits in with the farm life cycle concept (Calus et al., 2008; Potter & Lobley, 1992). This farm life cycle concept suggests that a farm can be in one of three stages: growth, maturity or decline. Younger farmers are expected to grow, while older farmers are expected to be in the maturity or decline stages. However, farmers with a successor do not enter the decline stage but rather are more likely to want to grow the farm in order to leave a legacy for their successor (Calus et al., 2008; Inwood & Sharp, 2012). The finding that farmers with successors are more willing to buy land but are significantly less likely than farmers without successors to want to lease in land may be related to the lack of trust amongst Irish farmers in the leasing system (Banovic et al., 2015; Bogue, 2013).

Farm size and age effects align with previous studies, with bigger farms and younger farmers most likely to want to add land, while farmers who are older significantly less likely to want to increase their farm size (Gale, 1994; Lobley & Butler, 2010; Katchova & Ahearn, 2015; Weiss, 1999). Older farmers were not significantly more likely to want to lease out or sell land than average aged farmers, supporting the theory that older Irish farmers want to maintain land within the family unit rather than sell or lease it out to others (Banovic et al., 2015). The finding that small farms are less likely than average sized farms to want to add land may be related to the higher levels of non-farm family income amongst these farmers. 65% of farmers with farms of less than 10 hectares derive less than half of their household income from the farm in contrast to 40% of

farmers in the overall sample. This suggests a high degree of part-time farming amongst these farmers, who may treat farming as a hobby rather than a profit-maximising enterprise.

Stocking rate is a signifier of increased interest in adding land. This may be related to dairy farmers (who have the highest stocking rates amongst Irish farm systems) now being able to expand following the lifting of quota restrictions in 2015. Dairy farmers are also significantly more likely than other farm systems to want to buy land.

Farmers with off-farm jobs are more likely to want to add land through lease or purchase than full-time farmers. There is evidence in the literature that off-farm income may help to prevent farm exit by stabilising income (Breustedt & Glauben, 2007; Kimhi, 2000). Farmers in the study with off-farm employment are younger than full-time farmers and may not have enough land to farm as a full-time occupation. Therefore, they may be aiming to increase land holdings going forward. In addition, there may be a wealth effect for farmers with off-farm jobs with farmers using their off-farm income in order to acquire more land through increased credit capacity or ability to pay higher rents.

Farmers who are neither highly dependent nor highly non-dependent on farm income are more likely to be willing to supply land through either lease or sale. These are farmers who derive between 26 and 75 per cent of their household income from farming and they represent 38% of the sample. Given that farmers with off-farm jobs wish to add land, it is likely that these farmers are full-time farmers whose spouses have off-farm employment.

The openness of cattle farmers to leasing out land may be related to the financial conditions facing cattle farmers in Ireland. Despite making up the largest share of farms in Ireland, the average cattle farm has consistently returned negative market incomes over recent years and is dependent upon subsidies for survival (Hennessy & Moran, 2016). Numerous interaction terms were tested in order to further clarify the finding but none proved significant. This may show that something intrinsic to cattle farming is causing this finding. One explanation may be the widespread protests amongst cattle farmers over low beef prices broke out in winter 2014, which although having ended following intervention by the Minister of Agriculture, may have led to cattle farmers

being particularly pessimistic when surveyed.³ As a result, cattle farmers may have felt more open to leasing out land at this time.

The factors that significantly influence farmers' openness to temporary land transactions such as leasing also seem to significantly influence permanent transactions such as buying and selling. However, there are some notable exceptions to this finding. Cattle farmers are open to leasing out land but not selling land while dairy farmers are open to buying land but not leasing in land. Cattle farmers' openness to leasing out may, as previously stated, have reflected particularly poor economic conditions at the time the survey was conducted. Their willingness to lease out rather than sell land may reflect a desire to reclaim the land for their own farming purposes once economic conditions for cattle farming improved. Dairy farmers' preference for buying land over leasing may reflect the infrastructural requirements of dairy farming, which are more easily satisfied when land rights are secured on a permanent basis.

6.7 CONCLUSIONS

Despite previous evidence that Irish farmers are reluctant to enter the land market (especially to supply land), this study shows that a considerable number of farmers are open to the possibility. It is important to understand what motivates farmers who are open to trading land. This is especially true in the absence of market data, as is the case in Ireland. This chapter suggests that farmer attitudes are an important motivating force behind farmers' willingness to enter land markets. Farmers are not motivated solely by profit maximisation, as evidenced by the significance of the 'Pleasure of Farming' and 'Conservative' variables. Additionally, there appear to be a group of farmers for whom the traditional attachment to land appears to be softening, as evidenced by the willingness of 'Innovative' farmers to supply land. Therefore, policymakers must take account of these attitudes when designing policies to enable a more dynamic land market.

Together with the economic and socio-demographic information presented here, a picture emerges of the types of farmer policymakers can target with land mobility policies. Young, optimistic farmers with higher than average stocking rates and plans for increasing production in the near future appear to be most likely to demand land.

³ 496 of the study's participants were surveyed in winter 2014, of which 196 were cattle farmers.

‘Innovative’ cattle farmers who are somewhat but not totally dependent on farm income and are planning to decrease farm activity in the near future are most likely to supply land. Policies that can both identify and mediate between these groups should be considered by policymakers.

There is a similar level of openness amongst farmers to both permanent and temporary land transfer options. This is contrary to conventional thinking that Irish farmers are reluctant to take part in temporary land transactions such as land leasing. This shows that there may be greater demand amongst farmers for land leasing arrangements than is currently thought by policymakers. As a result, policies that can promote and facilitate such leasing arrangements should be encouraged.

Chapter 7. USING CHOICE EXPERIMENTS TO INVESTIGATE FARMER PREFERENCES FOR LAND MOBILITY IN IRELAND

This chapter looks to gain insight into agricultural land rental markets by estimating farmers' willingness to pay (WTP) and willingness to accept (WTA) for land attributes. Given the high capital cost of purchasing farmland, it is likely that land rental will be the more accessible source of land for Irish farmers in coming years. Therefore, a discrete choice experiment (DCE) is used to estimate the value of land attributes to farmers in terms of renting in and renting out land. The results of the DCE indicate that all the examined land attributes (contract type, distance, soil quality and price) significantly affect farmers' WTP and WTA amounts for land and that WTA amounts are larger than WTP amounts for identical land attributes.

7.1 INTRODUCTION

In the context of increasing farmland prices, agricultural land rental markets are becoming an increasingly important source of land for European farmers. Farmland purchase prices are high for many reasons including competition for land from commercial farms and institutional investors, urban expansion and land use change (Cavailhès & Wavresky, 2003; Gertel & Sippel, 2016; Livanis et al., 2006; van der Ploeg et al., 2015). As a result, existing family farms are inhibited from expanding their land base and young and new entrant farmers can be prevented from entering the farming sector. Young and new entrant farmers are also at a disadvantage relative to landowners as farmers who already own land can use it as collateral to obtain credit for further expansion (Deiningner & Feder, 2001; Zondag et al., 2015).

Land rental markets allow young and new entrant farmers to access land at a much lower cost than if they were purchasing land. Land rental can also be advantageous to farmers who own their land as they can use credit on farm inputs besides land, such as stock and machinery. Land rental markets also provide much greater flexibility for farmers as land can be added and subtracted to suit economic and agricultural conditions (Ciaian et al., 2012d; Katchova & Ahearn, 2016; Swinnen et al., 2006).

Land rental markets are of increasing interest to Irish farmers and policymakers (Banovic et al., 2014; Donnelan et al., 2008; O'Neill & Hanrahan, 2012). Currently, about 18% of agricultural land in Ireland is rented but it is expected that demand for

rented land will increase in coming years (Geoghegan & O'Donoghue, 2014). Irish farmers currently rely upon the short-term (11 months) conacre system for land rental but there has been increased demand for long-term leases over recent years (SCSI/Teagasc, 2017).

One difficulty in studying Irish farmland rental markets is the lack of information concerning the structural drivers that drive land rental prices. The literature has mainly addressed this problem by using hedonic pricing models to study the contribution of land attributes and spatial factors to land prices and rents. Hedonic pricing suggests that the prices of heterogeneous goods are determined by the goods' characteristics and has been used to estimate implied values of individual farmland characteristics (Drescher et al., 2001). Hedonic studies of farmland rental and sales prices have been performed in many countries such as the United States (Elad et al., 1994; Herriges et al., 1992; Roka & Palmquist, 1997), England and Wales (Maddison, 2009), Spain (Gracia et al., 2007), Argentina (Choumert & Phélinas, 2015) and Germany (Breustedt & Habermann, 2011).

These models help to provide an overall picture of what drives rental prices but overlook the localised nature of land markets. One assumption of hedonic farmland models is that there are a large number of available properties with different levels of characteristics from which the land purchaser or renter may choose (Miranowski & Hammes, 1984). In reality, farmers are constrained in their land transaction choices by their farm's location and whatever land is available in close proximity to their farm. This is a problem for hedonic studies that generally use aggregated revealed preference data to impute the values of farmland attributes. Data is usually available for the land transactions that actually take place but not on the full set of land choices available to the farmer (Nickerson & Zhang, 2013). As a result, the choice set of land attributes from which to reveal farmers' land preferences is not observable.

In the Irish case, hedonic studies using revealed preference information for rental prices may not make sense for a number of reasons. Firstly, information gaps prevent proper estimation of the value of farmland attributes. Although the Teagasc National Farm Survey gathers information about rental prices and the proportion of rented land on a farm, information such as the soil, accessibility and contract type of the rented land is unavailable. Secondly, land markets are highly localised so finding a single market with a large enough volume of land transactions to estimate a hedonic model would be

difficult. Finally, land markets in Ireland are exceptionally thin, with less than 20% of land rented and less than 1% of land coming on the sales market each year (Donnelan et al., 2008).

This study intends to fill this information gap by using discrete choice experiments (DCEs) to estimate farmer preferences for land mobility. The discrete choice experiment has been a popular method for the valuation of non-market goods in Ireland such as water ecosystem services (Doherty et al., 2014; Stithou et al., 2012), agricultural landscape change (Hynes & Campbell, 2011), afforestation (Upton et al., 2012), rural residential location (Bullock et al., 2011) and water-based recreation (Hynes et al., 2009). This study will be the first analysing Irish agricultural land markets using the choice experiment methodology.

The choice experiment has only recently started to be used to study farmland markets. Qin et al. (2011) and Siikamäki et al. (2015) used choice experiments to examine farmers' preferences regarding forestland markets in China. They found that land rental price and contract length were significant factors influencing farmers' land market participation. Lizin et al. (2015) estimated Belgian farmers' land purchase preferences using a choice experiment involving 188 farmers and found that price, soil productivity, distance from farm, distance from other land and land use restrictions affected farmers' likelihood to buy farmland. Grammatikopolou et al. (2013) employed a choice experiment to study the effect of field plot proximity on farmers' land use decisions, finding that farmers were more likely to rent out land the further away it was from the farm compound.

The objective of this study is to gain insight into Irish agricultural land rental markets by estimating farmers' willingness to pay (WTP) and willingness to accept (WTA) compensation for differing land attributes. As opposed to other stated preference techniques such as contingent valuation, the choice experiment allows us to value the individual attributes of a good rather than valuing the good as a whole (Hynes et al., 2011). As a result, attributes can be ranked in order of importance to farmers. This approach provides us with information about the following farmland attributes: rental contract type; proximity of the land; land quality and rental price. In the Irish context, information about contract type and land proximity in regard to land rental is not currently available through any other source. Although Siikamäki et al. (2015)

estimated Chinese forestland supply and demand; this study is the first, to the authors' knowledge, to estimate farmers' preferences for farmland supply and demand in a developed country using a choice experiment.

This study is laid out as follows. Section 7.2 discusses random utility theory and the methodologies used to design and analyse discrete choice experiments. Section 7.3 describes the choice experiment used and how the choice experiment was administered. Section 7.4 provides a description of the results. Multinomial and random parameter logistic regressions are used to analyse the choice experiment and WTP/WTA estimates are implied. Section 7.5 covers a discussion of the results while Section 7.6 includes some conclusions and possible policy recommendations.

7.2 THEORY AND METHODOLOGY

The choice experiment approach is consistent with Lancaster's theory of consumer choice (Lancaster, 1966), which postulates that consumption decisions are determined by the utility that is derived from the attributes of a good rather than from the good itself. The econometric basis of the approach rests on the behavioural framework of random utility theory, which describes discrete choices within a utility maximising framework (McFadden, 1974; Ben-Akiva & Lerman, 1985). Statistical analysis of the responses obtained from a choice experiment can be used to derive the marginal values for attributes of a good or policy or an individual's willingness to pay to gain an outcome with a more desirable combination of characteristics.

The multinomial logit (MNL) model, also called the conditional logit (CL) model, is the most commonly used discrete choice model for the analysis of results from discrete choice experiments (Hensher et al., 2015). While the relative simplicity of the MNL model is a clear advantage, it has some important limitations. For example, the MNL framework imposes homogenous preferences across respondents and its concomitant assumption of the independence of irrelevant alternatives (IIA) (Hausman & McFadden, 1984). However, preferences may be heterogeneous and accounting for the presence of heterogeneity enables computations of unbiased estimates of individual preferences. In addition, accounting for preference heterogeneity provides a broader picture of the distributional consequences and other impacts of policy actions and provides better insight on policy outcomes. One of the innovations aimed at accounting for preference

heterogeneity in choice models is the random parameter logit or mixed logit (Train, 1998; McFadden & Train, 2000). This model represents an alternative approach for characterising the distribution of preferences in a given population. The random parameter logit model accounts for preference heterogeneity by allowing utility parameters to vary randomly (and continuously) over individuals.

In this study each respondent is presented with a series of $T = 12$ choices. In each choice the respondent is presented with $J = 3$ alternatives comprising two land rental options described in terms of key design attributes (type of land rental contract; distance of land from farmyard; soil quality; and price) and a status quo option. The attributes of alternative i in choice occasion t faced by respondent n are collectively labelled as vector X_{int} . The utility that respondent n derives from choosing alternative i on choice occasion t is given by:

$$U_{int} = \beta_n X_{int} + \varepsilon_{int} \quad (25)$$

where the coefficient vector β_n , representing individual tastes, is unobserved and varies randomly in the population with density denoted $f(\beta_n|\theta)$, where θ represents the parameters of this distribution and ε_{int} is an unobserved random term that is assumed to be independent and identically distributed (iid) according to an extreme value distribution. Conditional on β_n , the probability that the respondent chooses alternative i in choice occasion t is a standard conditional logit (McFadden, 1974), since ε_{int} follows an extreme value distribution:

$$L_n(i, t|\beta_n) = \frac{\exp(\beta_n X_{int})}{\sum_j \exp(\beta_n X_{jnt})} \quad (26)$$

Let y_{nt} denote the respondent's chosen alternative in choice occasion t , and let $y_n = (y_{n1}, \dots, y_{nT})$ denote the respondent's sequence of choices in the T choice occasions. The joint probability of the respondent's sequence of choices, conditional on β_n , is the product of standard logits:

$$P(y_n|\beta_n) = L(y_{n1}, 1|\beta_n) \dots L(y_{nT}, T|\beta_n). \quad (27)$$

However, the researcher does not observe β_n . Only its density $f(\beta_n|\theta)$ is assumed to be known, so the unconditional probability of the respondent's sequence of choices is the

integral of Eq. (27) over all possible values of β_n weighted by the population density of β_n as shown in Eq. (28).

$$P(y_n|\theta) = \int P(y_n|\beta_n)f(\beta_n|\theta) d\beta_n \quad (28)$$

The distribution of β can be specified as either continuous or discrete. As noted above, a model with continuously distributed coefficients results in a random parameter logit (RPL) specification (McFadden & Train, 2000), while cases where the coefficients follow a discrete distribution and where class membership preferences are homogeneous yield a latent class model (LCM). In the LCM, the mixing distribution $f(\beta_n|\theta)$ in Eq. (28) is discrete with β_n taking a finite set of values, one set for each class. The log-likelihood for both models is given by

$$LL(\theta) = \sum_n^N 1nP(y_n) \quad (29)$$

In the random parameter specification, this expression cannot be evaluated analytically because the choice probability (Eq. (28)) does not have a closed form. Hence, it is approximated using simulation methods (Train, 2003). In particular, a number of draws of β are taken from its density $f(\beta_n|\theta)$. For each draw, the product of logits in Eq. (27) is calculated, and the results are averaged over draws. The simulated log-likelihood used in estimation is given by:

$$SLL_{RPL}(\theta) = \sum_{n=1}^N 1n \left[\frac{1}{R} P(y_n|\beta^r) \right], \quad (30)$$

where R is the number of replications (i.e. draws of β) and β^r is the r th draw. Halton intelligent draws are used for the simulation, which have been found to provide far greater accuracy than independent random draws in the estimation of random parameter models (Train, 2003). In this analysis, 500 Halton draws were used to estimate the RPL.

Parameter estimates based on choice experiments can be used to calculate willingness to pay and willingness to accept measures for improvements or reductions in utility. Taking the systematic component of the utility in Eq. (25), the individual preference coefficient β can be defined as linear in preference weights (β_1, \dots, β_k) and additive in attributes (X_1, \dots, X_k)

$$U_{int} = \beta_{0i} + \beta_1 X_{1int} + \dots + \beta_{k-1} X_{k-1int} + \beta_k X_{kint} \quad (31)$$

The total derivative of Eq. (31) with respect to changes in the non-cost attribute X_{k-1} and cost attribute X_k is defined as

$$\partial U_{int} = \beta_{k-1} \partial X_{k-1} + \beta_k \partial X_k \quad (32)$$

Setting this expression equal to zero and solving for $\partial X_k / \partial X_{k-1}$ yields the expression for willingness to pay

$$\frac{\partial X_k}{\partial X_{k-1}} = WTP_{k-1} = -\frac{\beta_{k-1}}{\beta_k} \quad (33)$$

Deriving willingness to pay estimates for the random parameter model is less straightforward than in the CL model. Since the willingness to pay for an attribute is given by the ratio of the attribute coefficient to the monetary coefficient, the WTP from a random parameter logit model is given by the ratio of two randomly distributed terms. Depending on the choice of distribution for the coefficients, this can lead to WTP distributions which are heavily skewed and that may not even have defined moments (Hole & Kolstad, 2012). A common approach to dealing with this potential problem is to specify the monetary coefficient to be fixed and allow the non-monetary coefficient to be random. For the random parameters, the WTP measures are constructed using the unconditional parameter estimates (population moments), which are obtained by simulating the population (Hensher et al., 2005). A vector of 10,000 sets of parameters is drawn for each model to estimate changes in WTP and WTA.

7.3 DATA

Choice Sets

The survey instrument for this study was designed through discussion with experts, focus group input and pilot testing in the field. The main purpose of these discussions was to identify the attributes that most interested farmers in terms of land rental and to ascertain the appropriate levels of each attribute. The final set of attributes and levels used in the choice experiment are listed in Table 7.1.

Four attributes were settled upon for the choice experiment: type of land access; distance of land from farmyard; the soil quality of the land; and the rental price of the land. Type of land access describes the type of rental contract the land would be rented under and had two levels: conacre and lease. A conacre contract lasts eleven months

while a lease contract lasts at least five years. These types of rental contract were chosen as they represent the most prevalent forms of land rental contract in Ireland. The distance from farmyard attribute has three levels: adjacent; one kilometre away and five kilometres away. Each level denotes how far the land in question was from the main farmyard. The distance attribute was included as it was hypothesised that farmers would be willing to pay more to rent land closer to their farmyard and was identified as a key attribute in the focus group discussions. The five kilometre level was included to examine whether farmers would be more likely to rent out land if it was a significant distance away from their farmyard.

The soil quality attribute has three levels: good; medium and poor. To avoid subjective interpretation of these levels by participants, each soil quality level was accompanied by a description of the soil's characteristics. Good quality soils were defined as those suitable for a wide range of agricultural uses and so had no usage limitations. Medium quality soils were defined as being somewhat limited by poor draining or altitude. Poor quality soils were defined as those which are very limited for agriculture, giving the example of mountain areas. Soil quality definitions were drawn from Ireland's main national farm survey, Teagasc's National Farm Survey (Hennessy & Moran, 2016). It was hypothesised the farmers would be willing to pay more for land with better quality soil and would be more willing to rent out land with soil of poorer quality.

The attribute describing the price for one hectare of land has six levels: €100; €200; €300; €400; €500; and €600. Prices were also presented to participants in terms of price per acre as focus group discussion had shown that farmers usually think of land prices in these terms. Prices were chosen so as to reflect a range of prices above and below average market rental prices.

Table 7.1 Attributes and Attribute Levels

<i>Attribute</i>	<i>Definition</i>	<i>Level</i>
Type of land access	The type of rental contract under which the farmer would rent in/out land. Conacre represents a rental term of 11 months while the leasing represents a rental term of at least five years.	Conacre vs. lease
Distance from farmyard	The distance of the land from the farmyard. The farmyard generally represents the centre of the farm's operation.	Adjacent; 1 kilometre; 5 kilometre
Soil quality	The soil quality of the land in question. Three types of soil quality were available: good; medium and poor. Good land was defined as land suitable for a wide range of agricultural uses and so had no usage limitations. Medium quality soil was defined as land somewhat limited by poor draining or altitude. Poor quality soil was defined as land that was very limited for agriculture such as mountain areas. These definitions were provided in the choice sets to the participants.	Good; medium; poor
Price	The price of renting in/out one hectare of the land in question for 11 months. Prices in the choice sets were also provided in terms of €/acre as Irish farmers are more accustomed to thinking of land prices in per acre rather than per hectare terms.	€600; €500; €400; €300 €200; €100

Each choice task consisted of two land rental choice alternatives and one “status quo” (SQ) option where the farmer indicated a choice for no change for their current land holding position (see Table 7.2). Given the number of attributes and levels involved in the design, there were 108^2 possible combinations ($2 \times 3 \times 3 \times 6 = 108$). For this reason, an efficient choice card was used. Each respondent faced 12 choice combinations out of all possible combinations, so 24 choice situations were selected and blocked into two subsets of 12 choice situations. Given that both the ‘Rent In’ and ‘Rent Out’ choice experiments were identical bar the direction of the land transaction, the same design process took place for each of the two choice experiments.

The experimental design for each choice experiment was constructed in the software package Ngene using a Bayesian *D*-efficient design. Efficient, as opposed to orthogonal, designs aim not just to minimise correlation in the data for estimation purposes but aim

to result in data that generates parameter estimates with as small as possible standard errors (Hensher et al., 2015). The *D*-efficient design aims to produce a design with the lowest possible *D*-error (a measure of inefficiency). The Bayesian approach uses information about the parameters in the design (usually called “priors”). The priors are assumed to be random following some given probability distribution to express the uncertainty about the true value of the parameters. In this case, the priors were derived from pilot surveys where the DCE was tested in the field. The Bayesian approach requires the use of simulation methods to evaluate the efficiency of a design. This study used Gaussian quadrature to minimise the approximation error when calculating the Bayesian efficiency (Bliemer et al., 2008; ChoiceMetrics, 2014).

Table 7.2 A Sample Choice Set

	Option A	Option B	Option C
Type of Land Access	Conacre out	Lease out	No change from current land holding position
Distance From Farmyard	1km	5km	
Land Quality	Poor – Land very limited for agriculture e.g. mountain areas	Medium – Land somewhat limited by poor draining or altitude	
Price	€200 (€81 per acre)	€300 (€121/acre)	

Survey Implementation

The sample frame for this study consists of Irish farmers in 2014 and 2015. Quota controlled sampling was used to survey a representative number of farmers across the country. A starting location was randomly selected in each county with every third farmer being selected to participate in the study. The survey continued in each county until a quota of respondents in each county was reached. The quotas used here were based on known population distribution figures in relation to specific farm systems (dairy, cattle rearing, cattle other, sheep, tillage and mixed) taken from Central Statistics Office data (CSO, 2012). The survey instrument had three sections. Section A included questions relating to characteristics of the farmer and their farm such as age, gender,

education, farm size, farm system, soil type and level of current and future farming activity. Section B consisted of the choice experiment. Respondents were randomly divided into two groups with one group taking the 'Rent In' choice experiment and one group taking the 'Rent Out' version. To begin the experiment, respondents were shown an example choice card and the interviewer talked through the choices with the respondent. The respondent was then asked which of the three options (Option A, Option B or the SQ option, Option C) they would prefer and asked to make a choice. Following this, the interviewer moved onto the choice experiment proper. Each choice set was presented by the interviewer to the respondent with the respondent choosing the option they most preferred in each choice set. Twelve choice sets in all were shown to each respondent. Section C of the survey instrument asked about the farmer's future plans in relation to retirement, succession and inheritance, as well as examining the farmer's attitude towards land mobility as a whole. Surveys were administered in two waves. The first wave started in November 2014 and proceeded until February 2015. The second wave of surveys began in October 2015 and was completed in March 2016. The final response total for the first wave of surveys was 496, with 350 respondents being added by the second wave. As a result, the total sample size was 846 respondents.

Hypotheses

In terms of the 'Rent In' choice experiment, no *a priori* hypothesis is made about contract type. Although short-term conacre lettings are by far the most popular type of land rental contract in Ireland, it may be that farmers would prefer long-term contracts but have never had the choice of entering such a contract. The popularity of long-term rental contracts in other developed countries suggests that short-term renting is popular in Ireland for historical rather than efficiency reasons. On the other hand, Irish farmers may prefer the flexibility that short-term contracts allow over the security of long-term contracts.

It is expected that farmers will prefer to rent land in the closer it is to their farmyard. Land closer to the farmyard is more convenient for the farmer to access and for drystock and dairy farmers, more easily facilitates the movement of animals. It is hypothesised that farmers will prefer to rent in land of better quality compared to land of poorer quality given the productivity advantage that is provided by better quality soil. Finally,

it is expected that farmers are less likely to want to rent in land the higher the rental price of the land.

In the 'Rent Out' choice experiment, again no *a priori* hypothesis is made about contract type for the same reasons outlined above. Based on previous research (Grammatikopolou et al., 2013), farmers are expected to prefer to rent out land that is further away from their farmyard. It is hypothesised that farmers will prefer to rent out land that is of worse quality as it is expected that farmers would prefer to keep their best quality land for themselves. Finally, it is expected that farmers are more likely to rent out land the higher the rental price of the land.

7.4 RESULTS

Descriptive Statistics

A total of 846 farmers were surveyed across the 26 Irish counties. Of these, 425 farmers took the survey containing the 'Rent In' version of the choice experiment while 421 took the 'Rent Out' version. Descriptive statistics concerning the characteristics of the survey respondents are listed in Table 7.3. The average age of the survey respondents was 54 years; with the average farm size across the sample being 45.5 hectares. Dairy farmers comprised 21.1% of the sample, with cattle rearing farmers making up 14.2% and cattle other farmers 29.2%. Sheep farmers made up 15.1% of surveyed farmers, tillage farmers 11.1% and farmers with a mixed enterprise 5%. Farmers who had farmland with good quality soil made up 52.8% of the sample, compared with 38.9% who had medium quality soil and 8.3% who had poor soil. Of the sampled farmers, 71.1% had children while 43.3% of farmers had a designated successor. Nearly half of sampled farmers (43.3%) relied on farm income for over 75% of farm income. This compared with 19% of farmers relying on farm income for up to 25% of household income, 20.9% relying on farm income for 26-50% of household income and 16.8% relying on farm income for 51-75% of household income.

Table 7.3 Descriptive Statistics

<i>Variable</i>	<i>Mean</i>
Age (Years)	54.4
Farm Size (Ha)	45.5
Dairy (%)	21.1
Cattle rearing (%)	14.2
Cattle other (%)	29.2
Tillage (%)	11.1
Sheep (%)	15.1
Mixed (%)	5.0
Good soil (%)	52.8
Medium soil (%)	38.9
Poor soil (%)	8.3
Have children (%)	71.1
Have designated successor (%)	43.3
Household income from farm: 0-25% (%)	19.0
Household income from farm: 26-50% (%)	20.9
Household income from farm: 51-75% (%)	16.8
Household income from farm: 76-100% (%)	43.3
Chose SQ in Rent In CE (%)	67.3
Chose SQ in Rent Out CE (%)	67.8

In terms of the choice experiments, a high proportion of respondents chose the SQ option in both the ‘Rent In’ and ‘Rent Out’ versions of the experiment. Of the 5,100 choice decisions made in the ‘Rent In’ choice experiment, 67.3% of the choices were for the SQ option. In the ‘Rent Out’ choice experiment, 67.8% of the 5,052 choice decisions were for the SQ option. Given the static nature of the Irish land market, it was expected that a large proportion of respondents would choose the SQ option, especially in terms of the ‘Rent Out’ decision. Geoghegan et al. (2017b) found that 29% of farmers were willing to lease out land, which matches with the 32% of non-SQ option choices here. However, the same paper found 51% of farmers were willing to lease in land, compared to just 33% of the choice decisions here.

High levels of SQ choice are not unusual within the DCE literature (Adamowicz et al., 1998; Lanz & Provins, 2015; Meyerhoff & Liebe, 2009). Rates of SQ choice exceeding 60% in choices tasks have been found by Hartman et al. (1990, 1991), Boxall et al. (2009) and Lanz and Provins (2006). However, it is difficult to generalise about levels of SQ responding in the DCE literature as many studies do not provide information on SQ response rates (Brennan, 2017).

However, SQ options are chosen often enough in DCE choice tasks for the possibility of a status quo effect amongst respondents to be discussed. Scarpa et al. (2005) define this

effect as the systematic inclination of respondents to display a different attitude towards SQ alternatives from those reserved to alternatives involving some change. The literature distinguishes between explanations for an SQ effect based on respondents' preferences and explanations owing to the choice task itself. Respondents' preferences can be influenced by such elements as risk aversion (Hartman et al. 1991), endowment effects (Atkinson, 2011) and regret avoidance (Chernev, 2004). Explanations based on choice task design and methodology include respondents opting out of the choice exercise due to choice task complexity (Marsh et al. 2011), protest beliefs (Bonnichsen and Ladenburg, 2010) and unrealistic attribute levels (Pearce & Özdemiroglu, 2002).

Model Estimates

Results of the multinomial logit (MNL) and random parameter logit (RPL) models for the 'Rent In' DCE and the 'Rent Out' DCE are reported in Tables 4 and 5 respectively. Estimates of willingness to pay and willingness to accept and associated 95% confidence intervals for both models are reported in Tables 6 and 7 respectively. All models were significant according to the Wald test. Large improvements in the pseudo *R*-squared statistic, log-likelihood and AIC and BIC Criteria were observed between the MNL and RPL models. The pseudo *R*-squared statistic improved from 0.29 to 0.39 for the 'Rent In' models and from 0.25 to 0.37 for the 'Rent Out' models. The AIC and BIC Criteria are both lower for the RPL models, indicating improved model fit (Hynes et al., 2008). This suggests that the RPL has a better model fit and should be used for further analysis.

An alternative-specific constant (ASC) was used to represent choices for the status-quo option. The ASC was significant and positive for both the MNL and RPL 'Rent In' models but was significant and negative for the MNL and RPL 'Rent Out' models. This suggests that *ceteris paribus*, respondents prefer the status-quo option over alternatives A and B in the 'Rent In' DCE but prefer alternatives A and B over the status-quo in the 'Rent Out' DCE. Given that a similar percentage of respondents chose the SQ option in both DCEs, it is unexpected to find significant but opposite status-quo estimates in each DCE. This finding may be related to the price variable. Price has a significant and negative effect on willingness to rent out land i.e. as price increases, willingness to rent out decreases. When price is omitted from the analysis, the ASC in the MNL and RPL 'Rent Out' models switches sign to become positive and is highly significant. When

price is left out of the 'Rent In' models (where price has a positive coefficient), the ASC remains positive and significant. Therefore, a preference for the SQ option may be present in both the 'Rent In' and 'Rent Out' models but the presence of the highly significant negative price variable is influencing the ASC coefficient to return a negative sign.

**Table 7.4 Parameter Estimates for Farmers' Preferences to Rent In Land
Based on Multinomial Logit and Random Parameter Logit Models**

	<i>MNL (Whole Sample)</i>	<i>MNL (Sample minus Serial SQ)</i>	<i>RPL (Whole Sample)</i>	<i>RPL (Sample minus Serial SQ)</i>
Variable				
<i>Mean of main effects</i>				
Contract - Conacre	0.07 (0.05)	0.06 (0.05)	-0.41*** (0.11)	-0.01 (0.07)
Distance – 1km	-0.43*** (0.07)	-0.50*** (0.07)	-0.74*** (0.10)	-0.64*** (0.10)
Distance – 5km	-0.15** (0.06)	-0.16** (0.07)	-0.55*** (0.13)	-0.23** (0.10)
Soil - Medium	0.68*** (0.08)	0.71*** (0.08)	0.23 (0.15)	0.81*** (0.10)
Soil – Good	1.35*** (0.07)	1.51*** (0.08)	0.79*** (0.18)	1.71*** (0.10)
Price	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
ASC - SQ	18.92*** (1.56)	20.91*** (1.69)	33.59*** (2.21)	27.32*** (1.98)
<i>Interactions</i>				
Age*ASC	0.03*** (0.00)	0.01* (0.00)	0.02*** (0.01)	0.00 (0.01)
Dairy*ASC	-0.31*** (0.09)	0.16 (0.11)	-0.18 (0.17)	0.25 (0.15)
Cattle Rearing*ASC	-0.21** (0.10)	0.35*** (0.12)	-0.20 (0.20)	0.40** (0.17)
Tillage*ASC	0.51*** (0.11)	0.31** (0.15)	1.09*** (0.24)	0.52** (0.22)
Sheep*ASC	0.20** (0.10)	0.01 (0.14)	0.29 (0.21)	0.05 (0.18)
Size*ASC	-0.01*** (0.00)	-0.00*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Children*ASC	-0.15*** (0.08)	-0.07 (0.11)	-0.11 (0.15)	-0.05 (0.15)
Successor*ASC	-0.07 (0.07)	0.00 (0.10)	-0.16 (0.14)	0.02 (0.13)
Off-farm Job*ASC	-0.27*** (0.09)	-0.38*** (0.11)	-0.59*** (0.17)	-0.54*** (0.15)
0-25% Income from Farm *ASC	0.25** (0.11)	0.41*** (0.13)	0.62*** (0.22)	0.56*** (0.19)
26-50% Income from Farm*ASC	0.37*** (0.10)	0.39*** (0.13)	0.81*** (0.21)	0.59*** (0.18)
51-75% Income from Farm *ASC	0.32*** (0.09)	0.39*** (0.12)	0.75*** (0.20)	0.56*** (0.17)
Medium Soil on Farm*ASC	-0.13* (0.07)	-0.15* (0.09)	-0.36** (0.14)	-0.24* (0.12)
Good Soil on Farm*ASC	-0.04 (0.13)	-0.41** (0.19)	0.05 (0.26)	-0.42* (0.26)

<i>Standard deviations of random parameters</i>				
Contract - Conacre			1.25*** (0.12)	0.47*** (0.10)
Distance – 1km			0.58*** (0.14)	0.53*** (0.13)
Distance – 5km			1.21*** (0.14)	0.93*** (0.11)
Soil - Medium			1.74*** (0.16)	0.62*** (0.12)
Soil – Good			2.62*** (0.19)	0.89*** (0.10)
<i>Model summary</i>				
Log-likelihood	-3967.573	-2651.2539	-3401.5774	-2561.329
Pseudo R2	0.2919	0.1218	0.3929	0.3392
AIC	7977.146	5344.408	6682.722	5174.657
BIC	8137.494	5491.508	6881.247	5357.106

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are in brackets.

In the ‘Rent In’ models, all of the main attributes are significant except for contract type in the MNL model and the adjacent distance dummy variable in the RPL model. All the standard deviation estimates in the RPL model are significant, suggesting significant preference heterogeneity within the sample. Contract type is insignificant in the MNL model but significant in the RPL model. Its negative sign indicates that farmers prefer renting in land through leasing rather than through the conacre system. Farmers prefer to rent in land that is adjacent to their farmyard, compared to 1km or 5km away. However, farmers prefer land 5km away to land 1km away. Farmers prefer land with better quality soil with good soil preferred to medium and medium soil preferred to poor. As would be expected, farmers’ land preferences are negatively related to price.

A number of interaction terms are added to the model in order to investigate the high rates of status-quo choice. Older farmers are more likely to take the SQ option, as are farmers with a tillage system. Farmers are less likely to choose the SQ option as size increase. Farmers with off-farm jobs are also more likely to stick with the status quo, as are farmers who rely on farm income for over 75% of household earnings and farmers with medium quality soil on their farm.

Table 7.5 Parameter Estimates for Farmers' Preferences to Rent Out Land Based on Multinomial Logit and Random Parameter Logit Models

Variable	<i>MNL</i> (Full Sample)	<i>MNL</i> (Sample minus Serial SQ)	<i>RPL</i> (Full Sample)	<i>RPL</i> (Sample minus Serial SQ)
<i>Mean of main effects</i>				
Contract - Conacre	-0.09* (0.05)	-0.10* (0.05)	-1.03*** (0.15)	-0.16** (0.08)
Distance – Adjacent	0.07 (0.06)	0.09 (0.07)	-0.71*** (0.16)	0.05 (0.10)
Distance – 1km	0.05 (0.06)	0.50 (0.07)	-0.50*** (0.14)	0.00 (0.09)
Soil - Medium	-0.13* (0.07)	-0.13* (0.07)	-0.92*** (0.16)	-0.28*** (0.10)
Soil – Good	0.09 (0.06)	0.11 (0.07)	-0.78*** (0.18)	0.07 (0.11)
Price	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
ASC - SQ	-7.59*** (1.48)	-9.68*** (1.57)	-13.30*** (2.06)	-13.02*** (1.90)
<i>Interactions</i>				
Age*ASC	0.00 (0.00)	-0.10** (0.00)	0.00 (0.01)	-0.02*** (0.01)
Dairy*ASC	0.20** (0.08)	0.31*** (0.11)	0.10 (0.16)	0.17 (0.15)
Sheep*ASC	0.58*** (0.10)	0.32** (0.15)	0.70*** (0.20)	0.23 (0.21)
Size*ASC	0.00** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
Children*ASC	-0.37*** (0.07)	-0.43*** (0.11)	-0.35** (0.15)	-0.35** (0.15)
Successor*ASC	0.24*** (0.07)	0.49*** (0.10)	0.36*** (0.14)	0.48*** (0.14)
Off-farm Job*ASC	-0.42*** (0.08)	0.51*** (0.12)	-0.60*** (0.17)	-0.54*** (0.16)
26-50% Income from Farm*ASC	-0.68*** (0.10)	-0.52*** (0.15)	-1.24*** (0.20)	-0.67*** (0.21)
51-75% Income from Farm*ASC	-0.36*** (0.11)	0.07 (0.16)	-0.48** (0.23)	0.21 (0.22)
76-100% Income from Farm*ASC	-0.77*** (0.11)	-0.54*** (0.16)	-1.07*** (0.23)	-0.50** (0.22)
Medium Soil on Farm*ASC	0.20*** (0.07)	0.40*** (0.10)	0.48*** (0.14)	-0.28*** (0.10)
Good Soil on Farm*ASC	0.43*** (0.13)	-0.03 (0.21)	0.57** (0.27)	0.07 (0.11)

<i>Standard deviations of random parameters</i>				
Contract - Conacre			1.99*** (0.16)	0.69*** (0.11)
Distance – Adjacent			1.90*** (0.16)	0.94*** (0.11)
Distance – 1km			1.49*** (0.13)	0.70*** (0.11)
Soil - Medium			1.73*** (0.14)	0.85*** (0.11)
Soil – Good			2.43*** (0.22)	1.08*** (0.11)
<i>Model summary</i>				
Log-likelihood	-4188.3013	-2574.6586	-3475.3123	-2451.6571
Pseudo R2	0.2454	0.0332	0.3739	0.0478
AIC	8414.603	5187.317	6904.521	4951.314
BIC	8559.499	5318.261	7087.549	5116.717

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are in brackets.

In the ‘Rent Out’ model, all the main coefficients are significant in the RPL model, with only the contract type, medium soil and price variables being significant in the MNL model. The conacre contract type is significant and negative, indicating that farmers would prefer to rent out land on a long-term lease basis rather than the eleven month conacre system. Farmers are more likely to rent out land that is farther away from the farmyard, with farmers preferring to rent out land 5km away over 1km away and 1km away over adjacent to the farmyard. Farmers are more likely to rent out land with poor quality soil as opposed to land with soil of medium or good quality. However, farmers are less likely to rent out land with medium quality soil than land with good soil quality. Price is positively related to choosing to rent land out.

The additional interaction terms indicate that sheep farmers, farmers with large farm sizes, farmers with designated successors, farmers with better quality soil and farmers who rely on farm income for 25% or less than their household income are more likely to choose the SQ option. Farmers who have children and who have an off-farm job are less likely to choose the SQ option.

Different estimates are obtained for the RPL model compared to the MNL model due to the former’s relaxation of the independence of irrelevant alternatives (iia) assumption. A limitation of MNL models is that coefficients of variables that enter the model are

assumed to be the same for all respondents, i.e. that respondents have homogenous preferences. The relaxation of the iia assumption in the RPL allows for heterogeneous preferences among respondents to be represented in model estimates. The statistically significant standard deviations obtained in the RPL models for both the ‘Rent In’ and ‘Rent Out’ DCEs confirms the existence of heterogeneity in respondents’ preferences regarding the land rental attributes.

Alternative Model Excluding Serial SQ Responders

Due to the high rate of SQ choice by respondents, the ‘Rent In’ and ‘Rent Out’ models are also run without serial SQ responders. In this context, serial SQ responders are defined as respondents who choose the SQ option on all choice occasions. Overall, 415 respondents (49.1%) chose the SQ option in each of the 12 choice occasions they faced. For the ‘Rent In’ DCE, 196 (46.1%) respondents chose the SQ option on all choice occasions while in the ‘Rent Out’ DCE, 219 (52%) respondents were serial SQ responders. The ‘Rent In’ model without serial SQ responders comprises 229 respondents and 8,244 choice observations while the ‘Rent Out’ model has 202 respondents and 7,272 choice observations.

Estimates from the MNL models have the same sign and significance levels as those in the full sample for all the main effects variables. Differences can be seen in the interaction terms but this is to be expected as the composition of the ASC has changed with the exclusion of the serial SQ responders. The dairy, sheep and children interaction terms in the ‘Rent In’ MNL model, which were previously significant are no longer so and the cattle rearing interaction term changes sign from negative to positive. In the ‘Rent Out’ MNL model, the interaction terms representing having good quality soil and deriving 51-75% of household income from farming change from significant to insignificant in the alternative model. The age interaction variable becomes significant when the serial SQ responders are removed from the ‘Rent Out’ MNL model, indicating a negative relationship between age and choosing the SQ option in the alternative model.

Some differences can be observed in the RPL main effects estimates when the serial SQ responders are removed from the sample. In the ‘Rent In’ model, contract type, which was significant when the full sample is used, becomes insignificant in the reduced

sample model. Farmers also significantly prefer medium quality soil to poor soil in the reduced sample model whereas in the full sample, there was no significant preference for medium soil. In the 'Rent Out' model, the distance variables, which were both significant using the full sample, both become insignificant when serial SQ responders are removed. Farmers were also significantly less likely to want to rent out good land compared to poor land in the full sample model but this relationship becomes insignificant in the reduced sample model. Changes in significance levels were also seen in the age, cattle rearing and good soil interaction terms in the alternative 'Rent In' RPL model and in the age, sheep and deriving 51-75% of household income from farming interactions terms in the 'Rent Out' model.

Willingness to Pay/Accept Estimates

The WTP estimates for both the MNL and RPL models are presented in Table 7.6. In the MNL model, there was no effect for contract type but the RPL model revealed a significant preference for leasing land rather than renting under the conacre system. Farmers are willing to pay €123/ha more for a long-term lease of at least five years compared to an eleven month conacre contract. Both the MNL and RPL models found farmers prefer land adjacent to their farmyard compared to land further away. Farmers were prepared to pay €221/ha more for land adjacent to the farmyard compared to 1km away and €155/ha more for adjacent land compared to land 5km away. Interestingly, farmers are prepared to pay €66 more for land 5km away compared with land 1km away. The MNL model finds significant preferences for good and medium soils over poor soils while the RPL model finds only a significant preference for good soils over poor soils. Farmers are willing to pay €251/ha more for land with good quality soil compared to land with soil of poor quality.

Table 7.6 Implied Willingness to Pay Estimates and 95% Confidence Intervals (€/ha)

	<i>Mean (MNL)</i>	<i>Lower limit</i>	<i>Upper limit</i>	<i>Mean (RPL)</i>	<i>Lower limit</i>	<i>Upper limit</i>
Contract - Conacre	35.69	-20.25	91.63	-123.41***	-59.12	-164.91
Distance – 1km	-237.46***	-320.68	-154.25	-221.17***	-185.35	-246.80
Distance – 5km	-83.42**	-155.23	-11.60	-155.07***	-103.13	-212.04
Soil - Medium	374.54***	271.17	477.92	68.99	187.11	-17.10
Soil – Good	738.40***	591.68	885.12	250.92***	385.00	117.45

Note: *** p<0.01, ** p<0.05, * p<0.1

The WTA estimates based on results from the MNL and RPL models are shown in Table 7.7. The RPL model finds significant effects for all the main attributes at the 1% significance level while the MNL model only returns estimates that are significant at the 10% level. Similar to the ‘Rent In’ model, farmers prefer to rent out land through a long-term lease compared to a short-term conacre contract. Farmers would require €648/ha more to accept a conacre contract over a lease agreement. Farmers prefer to rent out land that is further away from their farmyard, requiring €445/ha more to rent out adjacent land over land 5km away and €314 more to rent out land 1km away compared to 5km away. Farmers also prefer to hold onto better quality land compared to land with poor soil. Farmers require €495 more to rent out good land compared to land with poor quality soil and €576 more to rent out medium quality land compared to land with a poor soil type.

Table 7.7 Implied Willingness to Accept Estimates and 95% Confidence Intervals (€/ha)

	<i>Mean (MNL)</i>	<i>Lower limit</i>	<i>Upper limit</i>	<i>Mean (RPL)</i>	<i>Lower limit</i>	<i>Upper limit</i>
Contract - Conacre	-96.86*	-202.39	8.66	648.03***	374.25	1123.89
Distance – Adjacent	76.53	-53.78	206.84	444.57***	180.03	873.91
Distance – 1km	51.92	-77.81	181.66	314.04***	119.42	657.06
Soil - Medium	-129.81*	-269.53	9.91	575.96***	299.86	1065.06
Soil – Good	93.68	-34.08	221.45	495.20***	221.45	960.71

Note: *** p<0.01, ** p<0.05, * p<0.1

7.5 DISCUSSION

This study used the choice experiment approach to estimate farmers’ preferences for farmland attributes in the context of a land rental transaction. This allowed the determination of farmers’ marginal willingness to pay (or accept) for the land attributes. The results show that although each of the studied attributes contributes significantly to

the WTP and WTA amounts, some attributes are valued more highly by farmers than others and that average WTA attribute prices are far higher than what farmers are willing to pay for the same attributes. This is in line with what is seen in the actual land rental market in Ireland at present.

The results of the models revealed that farmers have a preference for long-term lease rental contracts over short-term conacre contracts in both the ‘Rent In’ and ‘Rent Out’ choice experiments. Although there was no *a priori* expectation about whether farmers would prefer conacre or lease contracts, the preference of farmers for leasing is an interesting finding within the Irish context. Short-term lettings have dominated the Irish farmland rental market for decades, mostly for historical reasons (Conway, 1986; Dooley, 2004). This stands in contrast to the practice of farmland rental in the rest of Western Europe where land is usually rented on a long-term basis (Ciaian et al., 2010). This study’s results may reflect a changing of attitudes amongst farmers towards long-term leasing that is yet to be fully reflected in market transactions. It has been a long-held policy aim of the Irish government to increase the usage of long-term lease agreements in agriculture (Inter-Departmental Committee on Land Structure Reform, 1978). This aim has mostly been pursued through tax exemptions on income from leasing farmland. The size and availability of this tax exemption was further increased in 2015 with anecdotal evidence that this measure has increased the number of long-term leases (SCSI/Teagasc, 2017). This is in line with Revenue data that shows the number of long-term leases has steadily risen from 2,960 registered agreements in 2009 to 5,130 in 2014 (Revenue, 2017). A preference for long-term leasing may also reflect unhappiness with aspects of the conacre system on the part of both the renter and the landowner. From the landowner’s perspective, the short-term nature of conacre rental disincentivises long-term grassland management and maintenance by the renter, leading to the land becoming less productive over time. For the renter, uncertainty over the renewal of the rental agreement every year prevents long-term infrastructural investment in the land, which may be necessary for farming systems such as dairy and tillage. Long-term rental contracts may help to resolve such problems.

Preferences in relation to the distance attribute conformed to expectations for the ‘Rent Out’ choice experiment as farmers’ willingness to rent out land increased the further the land was away from their farmyard. This is in agreement with previous research

findings that the distance of farmland away from the farmyard or farmer's residence is a significant factor in farmers' willingness to lease out that land (Grammatikopoulou et al., 2013; Patterson et al., 1998). In the 'Rent In' choice experiment, it was found that farmers prefer to rent in land adjacent to their farm over land 1km and 5km away but that land 5km away is preferred to land 1km away. It was hypothesised that farmers would prefer to rent in land the closer the land is to their farmyard. Although farmers prefer adjacent land to land further away, the finding that farmers prefer land 5km away to 1km away is contrary to our hypothesis. One reason for this finding may be the extremely localised nature of land markets in Ireland. In order to rent land that is 1km away, an Irish farmer would have to negotiate with a neighbouring landowner with whom they would very likely have a personal relationship. Given the fractious history of rural land ownership in Ireland, it is possible that such a relationship may dissuade the farmer from wanting to negotiate for that land. As a result, the farmer may prefer to rent in land from a landowner further away with whom they would not be as likely to have any close personal relationship, good or bad.

Farmers' preferences for soil type are generally in line with expectation. When renting in land farmers prefer land with good soil compared to poor soil. This reflects findings from the hedonic pricing literature which show higher implied prices for better quality farmland (Miranowski & Hammes, 1984; Roka & Palmquist, 1997). However, farmers have no significant preference for medium quality soil over poor soil. This may reflect the importance of soil quality to farming in Ireland. Due to the preponderance of pasture-based cattle and dairy farming in Ireland, high quality soil is important in order to maximise grass growth for grazing purposes and minimise feed costs (Dillon et al., 2008).

With regard to renting out, farmers prefer to rent out poor land compared with land of medium and good quality. It is reasonable that farmers would prefer to hold onto better quality land for their own farming purposes, requiring a greater amount of compensation to give such land up. The different WTA and WTP amounts for good land (compared to poor land) may be indicative of the static nature of Ireland's land rental market, especially in terms of farmer-to-farmer rental. The finding that farmers require €245 more to rent out good land compared to what they are willing to pay for the same quality of land suggests that there may be an endowment effect amongst

farmers with regard to land. However, the confidence intervals of the WTP and WTA estimates do overlap so it can be assumed that some land transactions would still take place within this hypothetical market.

The lack of land mobility seen in Irish agriculture is also apparent in the large, significant estimate for the status quo option in both the 'Rent In' and 'Rent Out' choice experiments. Nearly 68% of choices in each choice experiment were for the status quo option of farmers not changing their current land holdings. This may indicate that the price levels in the WTA choice experiment were not high enough in order to entice farmers into renting out land. However, given that the highest price level used was twice the mean price of good quality land in Ireland, using higher price levels may have affected the realism of the choice experiment. Additionally, given the significant cultural attachment to agricultural land in Ireland, it may be the case that there are a large number of farmers that would never rent out land at any realistic price.

The interaction terms, which interact the ASC with socioeconomic and agronomic variables collected as part of the survey, give some insight into why respondents choose to accept or reject the SQ option. There is an overlap between the attributes of farmers more likely to choose the SQ option in the 'Rent Out' DCE and less likely to choose the SQ option in the 'Rent In' version. An increase in farm size is associated with a greater likeliness to choose the SQ option in the 'Rent Out' DCE with the opposite being the case in the 'Rent In' DCE. Sheep farmers are also significantly more likely to take the SQ option in the 'Rent Out' DCE and to take one of the non-SQ alternatives in the 'Rent Out' version.

The findings derived from the interaction terms can also be compared with the results found in Chapter 6 concerning the openness of farmers to engaging in land transactions. Although land rental in that case was confined to land leasing, some parallels are apparent. Older farmers were significantly less likely to be open to leasing in land and are more likely to choose the SQ option in the 'Rent In' DCE here. In Chapter 6, farmers were less open to leasing land out if they had a successor and earned between 0 and 25% of household income from farming. These farmers were also more likely to choose the SQ option in the 'Rent Out' DCE.

The large number of respondents choosing the status quo option in the 'Rent In' choice experiment may be due to the makeup of the sample. When age is interacted with the ASC, it is a significant predictor of choosing the status quo option. Previous research has shown that age is negatively correlated with willingness to buy or rent in land amongst Irish farmers (Geoghegan et al., 2017b). Additionally, only existing farmers are surveyed in this study. There is evidence that there is a growing number of young people with a farming education who are unable to access land in order to start their farming careers (Macra na Feirme, 2017; O'Donoghue & Hennessy, 2015). Therefore, while this study covers the preferences of current farmers, the preferences of prospective farmers may not be identical, especially in relation to land demand.

One method of dealing with the issue of serial SQ response is to drop those observations from the sample (Adamowicz et al., 1998; Brennan & van Rensburg, 2016). When this method is applied to the current sample, some difference in coefficient estimates from the full sample results are observed in the RPL models for renting and renting out land. However, a problem with this method of dealing with SQ responses is that it assumes that serial SQ responders are not responding to the choice tasks based on their preferences for the attributes and attribute levels themselves. Instead, it is assumed that the participants are choosing the SQ repeatedly as a form of protest against the DCE or as a result of survey design effects such as task complexity or cognitive burden (Lanz & Provins, 2015). In order to properly determine the cause of participants' serial SQ response, follow-up surveys or exit questionnaires have proven useful (von Haefen et al., 2005; Windle & Rolfe, 2011). Without further information to show that serial SQ response was a result of problems with the DCE itself and not an expression of participants' preferences in relation to land rental, model results based on the full sample of participants have been preferred in this study.

Chapter 8. CONCLUSION

8.1 INTRODUCTION

This main objective of this thesis was to attempt to understand Irish farmers' preferences in relation to farmland mobility. This research takes place in the context of changing agricultural policy at both the Irish and EU level. In particular, the removal of the EU quota on milk production in 2015 has been seen by Irish policymakers as an opportunity for growth in the Irish dairy industry. As a result, a target of 50% growth in milk output by the year 2020 was set. In order to achieve this growth, changes may be required in Ireland's agricultural land structures. These structural changes will require land mobility through agricultural land markets. However, previous research has shown Irish farmland markets to be relatively static with little land being bought and sold and relatively low levels of land rental.

To determine the capacity of Irish land markets to enable the land restructuring that may be required to meet policy targets, this thesis firstly describes the current structure of farmland holdings in Ireland, as well as the current state of Irish farmland markets. This allows an estimation of the level of restructuring that may be required to achieve a 50% increase in milk production. Given the low levels of land rental and especially long-term leasing in Ireland, the financial returns associated with long-term leasing are determined and compared with average farm incomes. The role of tax and subsidy policy is also considered within this context.

The thesis uses survey information to identify the characteristics of farmers who are willing to enter the farmland market in terms of supply and demand. Attitudinal data is also employed in order to determine the role of attitudes with regard to openness to land transactions. Given the lack of data concerning the structural factors that drive Irish farmers' decisions in the area of land transactions, discrete choice experiments (DCEs) are used to elicit farmer's willingness to pay (WTP) and willingness to accept (WTA) for farmland. The DCE methodology provides insight into which attributes of farmland are important to farmers when transacting land and the valuations farmers put on those attributes.

To document the conclusions arising from this research, the remainder of this chapter is structured as follows. In Section 8.2, a summary of the main findings of the thesis is

presented. Section 8.3 contains a discussion of the thesis's findings with a particular focus on how these results relate to policy. Section 8.4 discusses some limitations of the work and some suggestions for future research based on the thesis's results. Finally, Section 8.5 outlines how the findings of this research have been disseminated.

8.2 SUMMARY OF FINDINGS

The results in Chapter 3 show that given current agricultural land structures in Ireland, it is unlikely that the target of a 50% increase in milk production will be met without additional land being made available to dairy farmers. Additionally, it appears unlikely that farmers from other farm systems will convert to dairy on a large enough scale to meet planned milk supply increases. As a result, increased land mobility will have to be facilitated through land markets in order for dairy farmers to have a large enough land base to reach policy targets.

The finding that policy targets are unlikely to be reached given current agricultural land structures means that policymakers will be required to consider ways to encourage land restructuring in order to achieve their stated policy aims. Although policy initiatives to increase land mobility have already been undertaken in recent years, increased efforts will be required if the necessary restructuring is to be achieved. Given the high capital cost of purchasing land, as well as the relative failure of early farmer retirement schemes in Ireland (Bika, 2007; Gillmor, 1999), policymakers should focus on land use rather than land ownership. While Irish farmers have historically favoured owning the land that they farm, increased focus should be placed on initiatives such as long-term leasing, share farming, farm partnerships, share milking and contract rearing. Arrangements such as these can allow young and new entrant farmers access to land and farm infrastructure without the need for changes in land ownership.

Using the hypothetical microsimulation model developed in Chapter 4, Chapter 5 suggests that the financial rewards possible for those wishing to make their land available through the rental market are substantial. Leasing out agricultural land on a long-term basis can prove more profitable for typical cattle and tillage farmers than farming the land. Only dairy farmers derive consistently higher disposable incomes from farming their land as opposed to leasing it out. However, changes in agricultural support policy can pose a risk to earnings derived from leasing.

These findings show that national and EU policy can interact in ways that can prove distortive to land markets. The results of the hypothetical model suggest that the tax incentives created by the Irish government to encourage long-term leasing help to ensure that leasing out land is financially viable compared to farming. Leasing out land on a long-term basis can be more profitable than farming for a wide selection of farmers. Nevertheless, the role of policy as an inhibiting factor on land mobility is apparent. The difference in lease income observed between the Entitlements Sale and Active Farmer Scenarios shows policy change can pose a risk to future income. As a result, farmers may have some justification for maintaining control over land to ensure flexibility in the case of future policy change.

Chapter 6 examines the characteristics of farmers who are open to entering the agricultural land market. Along with socio-economic and agricultural factors, attitudinal variables are predictive of a farmer's willingness to enter the land market. Farmers motivated by the pleasure of farming are more likely to demand land while farmers of an innovative nature are more likely to be willing to supply land. Conservative farmers are unlikely to be open to either supplying or demanding land. Dairy farmers and farmers with a high stocking rate are open to adding land while cattle farmers are more open to supplying land. Other factors such as age, income from farming and the presence of a successor influence farmers' willingness to enter the land market. Generally speaking, factors that significantly influence farmers' openness to temporary land transactions such as leasing also seem to significantly influence permanent transactions such as buying and selling.

The results found in Chapter 6 show that there is a greater willingness to enter the land market amongst farmers than would be assumed from on the findings of a static land market in Chapter 3. About half of the surveyed farmers are open to buying or leasing in land while about a quarter of farmers are willing to sell or lease out land. Additionally, distinct profiles of the farmers who are open to land demand and open to land supply can be observed. These profiles may aid policymakers in terms of better targeting land mobility policies. The importance of farmer attitudes is also highlighted as something which policymakers must take into account when designing land market policies.

Chapter 7 finds that farmers value various land attributes differently when deciding whether to rent in or rent out a piece of land. Farmers show a preference for long-term

lease contracts over short-term conacre contracts. When renting in land, farmers are willing to pay €123/ha more for a long-term lease contract compared to a conacre agreement. When renting out land, farmers require €648/ha more to accept a conacre contract over a lease contract.

Regarding distance, farmers prefer to rent out land the further away the plot of land is from the farmyard. Compared to land 5km away, farmers require €445 more to rent out a hectare of land adjacent to the farmyard and €314/ha to rent out land 1km from the farmyard. When renting in land, farmers display a preference for renting in land adjacent to their farm or 5km away over land that is 1km away. They will pay €221 more for a hectare of land adjacent to the farmyard compared to 1km away and €66/ha more for land 5km away compared to 1km away.

Farmers prefer to rent in land of good quality compared to land of medium and poor quality. They are prepared to pay €251/ha more for land of good quality compared to land of poor quality and €182/ha more for good quality land compared to that of medium quality. Farmers require €495 more to rent out land of good quality compared to land of poor quality and €576 more to rent out land of medium quality compared to poor quality land.

The results from Chapter 7 show that each of the studied attributes contributes significantly to WTP and WTA amounts. Therefore, all the attributes can be said to be important factors in farmers' decision making regarding land transactions. The results also show that a ranking of attributes is possible. In terms of renting in land, soil quality is the most important factor, followed by distance and then contract type. Regarding renting out land, contract type is the most important attribute, followed by soil type and finally distance. Average WTA prices are much higher than average WTP prices for the same attributes, which may help to explain the static nature of Ireland's agricultural land market. However, it can be assumed that some land transactions would still take place within this hypothetical market due to the observed overlap between the confidence intervals of the WTP and WTA estimates.

8.3 CONTRIBUTION

This research makes a novel contribution to the literature in several ways.

- A discrete choice experiment is used to estimate farmers' preferences for land attributes in the context of land rental markets. The simultaneous estimation of land supply and demand using this methodology has not been attempted before in the literature. This is also the first use of a DCE to estimate farmers' agricultural land preferences relating to land supply and demand in a developed country.
- The thesis provides insight into the characteristics of farmers who are open to supplying and demanding farmland. This can provide useful information to policy makers in terms of better targeting agricultural land mobility policies.
- The thesis highlights the importance of farmer attitudes in relation to land mobility. This shows that land use decisions by farmers are not solely driven by economic concerns, a finding which contributes to the attitudinal literature as a whole.
- The hypothetical microsimulation model presented in Chapters 4 and 5 provides a new framework through which to analyse land use policy in an economic context.
- The thesis presents Ireland as a case study to examine the effects of institutions on farmland markets. The finding that tax and subsidy policy can have significant distorting effects on agricultural land markets adds to the literature in this area.
- The structural analysis of Irish farmland shows that Ireland has sufficient land to reach agricultural policy targets but that the current prevailing land structures will provide an impediment to reaching stated policy goals. Land restructuring through existing farmers switching farm systems is also unlikely to occur. These findings can contribute to Irish agricultural policy discussions going forward.

8.4 LIMITATIONS AND FUTURE WORK

Although this thesis contributes to the literature as well as to policy discussions in a number of ways, some limitations of the work should be recognised. Firstly, the DCE

relies upon stated preference data, with farmers making land decisions based on hypothetical scenarios. As land rental markets can be observed, land demand can theoretically be used to infer farmers' revealed land preferences. However, an analysis of rental markets using revealed preference data is not currently possible in the Irish case due to data constraints. The collection of a data set that would make such an analysis possible may be an avenue for future work. In addition, the survey also only questioned current farmers, without accounting for non-farming landowners or potential farmers who do not currently occupy land. This was due to the difficulty of identifying and contacting such individuals. Therefore, the survey may underestimate total levels of willingness to supply and demand land.

The hypothetical microsimulation model described in Chapter 5 uses typical farm types in order to analyse the effect of tax and subsidy policy. Although such models can be useful analytical and communication devices for farm policy decisions, it can be argued that they fail to account for full population variability. A full distributional analysis, which would analyse the entire range of farms rather than just typical farm types, may give a more complete picture of how institutional policy affects land use decisions. Additionally, the microsimulation model is a static model and therefore does not incorporate the dynamic nature of how policy and land use decisions can interact with one another.

Future work will aim to build on the findings of this thesis, with an application for a PhD student to continue this work currently under review. It is planned to use a hedonic model to analyse the drivers of land values in Ireland, which are currently self-reported as part of the NFS. Additionally, a framework using GIS data will be developed in order to model land markets. The Teagasc Simulation Model of the Irish Local Economy (SMILE) will be adapted in order to use the results from the DCE to simulate land supply and demand. There is also scope to use a natural experiment involving the decoupling of Less Favoured Area (LFA) payments to measure the capitalisation effects of subsidies on Irish land rental prices.

8.5 DISSEMINATION OF RESEARCH

This section outlines where this research has been presented over the course of the completion of this thesis.

- A version of Chapter 3 was presented at the Agricultural Economics Society 89th annual conference at the University of Warwick in April 2015.
- In 2015, a paper based on Chapter 5 was accepted for presentation at the 5th World Congress of the International Microsimulation Association (IMA). This Congress was held 2-4 September 2015 in Luxembourg.
- A version of Chapter 5 was presented at the 150th European Association of Agricultural Economists seminar in Edinburgh in October 2015. The seminar's theme was "The spatial dimension in analysing the linkages between agriculture, rural development and the environment".
- A newspaper article based on Chapter 5 was published in the Irish Independent newspaper on November 18th, 2015. The article was co-written with Anne Kinsella. The article can be accessed at:
<http://www.independent.ie/business/farming/leasing-land-can-bring-huge-advantages-with-tax-incentives-34205616.html>
- A paper based on Chapter 5 was submitted to the journal *Agricultural Finance Review* in December 2015. Following revisions, the paper was accepted for publication in May 2017. The paper's reference is:
Geoghegan, C., Kinsella, A., & O'Donoghue, C. (2017). Institutional drivers of land mobility: The impact of CAP rules and tax policy on land mobility incentives in Ireland. *Agricultural Finance Review*, 77(3), 376-392.
- A version of Chapter 6 was presented at the Agricultural Economics Society 90th annual conference at the University of Warwick in April 2016.
- A paper based on Chapter 3 was submitted to the journal *International Journal of Agricultural Management* in January 2017.
- A paper based on Chapter 6 was submitted to the journal *Land Use Policy* in June 2017.
- Research from this thesis contributed to a book chapter in the book *Farm Level Microsimulation Modelling* edited by Cathal O'Donoghue. The book was published in 2017 by Palgrave Macmillan. The chapter's reference is:
O'Donoghue, C., Geoghegan, C., Leonard, B., & Kinsella, A. (2017).

Hypothetical microsimulation modelling. In C. O'Donoghue (Ed.), *Farm level microsimulation modelling* (pp. 63-86). Basingstoke: Palgrave Macmillan.

APPENDIX A - SURVEY DESIGN

INTRODUCTION

This appendix provides a description of the development of the survey questionnaire used in this research. The survey was the result of a thorough design process. The process began with a review of the literature, followed by consultation with agricultural experts interested in farmland mobility in Ireland. Following this, two focus group discussions were held with farmers in order to further identify the attributes of land that were important to them, as well as to refine the survey as a whole. In order to test the survey instrument prior to its use in the field, a number of pre-pilot interviews were conducted. To test the survey in the field, a pilot survey was collected. Contributions from the expert consultations, focus group discussions and pre-pilot interviews enabled identification of land attributes and alternatives, as well as aiding the design of the questionnaire as a whole.

The rest of this appendix is laid out as follows. A brief description of the literature is followed by details of discussions with experts, as well as focus group discussions. Results from the pre-pilot interviews and pilot survey are then presented followed by an overview of the questionnaire. The sampling strategy used to produce a representative sample of Irish farmers is then provided. Finally, a short summary of the appendix is given.

LITERATURE REVIEW

Prior to the commencement of the survey design process, previous studies that used discrete choice experiment (DCE) methodology in an Irish context were consulted. Such studies include Stithou et al., (2012), Upton et al. (2012), Bullock et al., (2011) and Hynes et al. (2009). However, to the author's knowledge, few studies have employed the DCE methodology with the farming population. As a result, studies from the international literature were consulted including Breustedt et al. (2008), Benjamin and Kimhi (2006), Schulz et al. (2014), and Broch and Vedel (2012). Studies which use survey methodologies in the Irish context were also examined including Hynes and Campbell (2011), Howley and Dillon (2012), Howley et al., (2102) and Doherty et al. (2014).

DISCUSSION WITH EXPERTS AND FOCUS GROUPS

In order to inform the research project, meetings with agricultural experts were held to discuss the issues surrounding land mobility. Experts included agricultural advisors and researchers with Ireland's primary agricultural authority Teagasc. The main purpose of these meetings was to discuss the topic of land mobility and agricultural land markets in general, to consider any issues they felt were important to address in the survey, and to debate possible attributes that should be included in the DCE. These discussions highlighted the importance of non-economic factors in land decisions and resulted in the inclusion of a set of attitudinal questions to the survey. The future importance of long-term leasing was also mentioned with an emphasis being placed on how the conacre system was no longer appropriate in a modern agricultural context. Therefore, the survey attempted to gain insight into farmers' awareness of leasing and how farmers felt about the practice. These discussions also helped to identify some of the attributes that may be important to farmers when making land transactions. Focus group discussions were held to further refine these attributes.

Two focus group discussions were held in June 2014 at the Mellows Campus in Athenry, Co. Galway. The focus group participants were drawn from farmers who were attending agricultural courses in Teagasc on the campus that day. Each focus group consisted of between eight and ten people and lasted approximately one hour each. In the first part of the discussion, participants in the focus group were invited to give feedback on the topic of land mobility in general. Following this, participants were asked to discuss their preferences with regard to land attributes and the issues they considered when transacting land. These discussions helped to solidify our thinking regarding the attributes that were included in the DCE and the levels attached to each attribute.

PRE-PILOT AND PILOT STUDIES

A number of pre-pilot interviews were conducted in order to test advance drafts of the questionnaire. The primary purpose was to test its length, comprehensibility, and whether there were any issues that needed to be addressed before piloting commenced. These interviews were conducted in September 2014. In addition to the pre-pilot interviews, a pilot survey was conducted during October 2014 by the research company Amarach (which also conducted the main survey). A total of 50 pilot surveys were

collected in order to further test the survey and to determine if any aspects of its design needed further amendment. Due to a concern that the DCE could produce a large amount of respondents choosing the status-quo (SQ) option, the results of the pilot study would also determine the final number of respondents that would be sampled.

The pre-pilot interviews and pilot study indicated that there were no difficulties in understanding the survey questions. A small number of questions were reported to be too long and were shortened to reduce the length of the survey. Regarding the DCE, it was found that the choice tasks were easy to understand. One addition to the DCE that arose from the pre-pilot stage was the statement of prices in per acre as well as in per hectare terms. This was because farmers were more accustomed to prices expressed in per acre terms. As was expected, a high proportion of farmers chose the SQ option in the choice tasks so the planned sample was raised by 350 up to a total of 846 participants.

QUESTIONNAIRE

In this section, an outline of the survey is provided, the full text of which can be found in Appendix B. The questionnaire consisted of a number of sections, which are described, in more detail below.

Section A: Farm and Farmer Characteristics

The first section of the questionnaire was devoted to questions seeking socio-economic, demographic and farm specific information from the respondents. The questions focused on farm size, farm system, number of animals, soil type, gender, age, marital status, number of children, education level, agricultural education level, recent farming activity level and plans for future farming activity levels.

Section B: Choice Experiment

The overall objective of this section was to obtain WTP and WTA estimates from farmers for land attributes. Interviewers were instructed to begin by giving an example choice card to the respondent and talking them through their possible choices. Each choice alternative was described by the interviewer. As a form of ‘cheap talk’ statement, respondents were asked to consider what they think the hectare of land represented in each choice alternative was worth to them for the period of time they would be renting it

in/out. Respondents were asked to imagine themselves actually earning/spending the amounts specified for the land. Previous studies have found that such scripts can help to reduce hypothetical bias among respondents (Aadland & Caplan, 2003; Cummings & Taylor, 1999). Respondents were then asked to choose their preferred alternative on the example choice card. When the interviewer was certain that the respondent understood the nature of the choice tasks, respondents were asked to complete 12 separate choice tasks.

Given the high number of SQ responses found in the pilot survey, a number of follow-up questions were asked of respondents who chose the SQ option in each choice task in order to gain more information about these farmers. These follow-up questions only appeared in the questionnaires containing the 'Rent Out' versions of the DCE. Respondents were asked if they would ever rent out land either through leasing or conacre. If respondents answered in the negative, they were asked their reason for do so from a list of alternatives. Respondents were also asked if they had rented out land in the past and if their opinion would change if the tax exemption currently applied to leasing out land also applied to close relatives such as a son or daughter.

Section C: Remainder of Questionnaire

Following the DCE, the survey asked respondents about their future plans in relation to retirement and succession. These questions were included in the survey since previous research has found that the presence of a successor can influence farmers' decisions in relation to land (Calus et al., 2008; Inwood & Sharp, 2012). Farmers were also asked about their on-farm and off-farm work in order to determine farming intensity.

Respondents were asked the level of agreement with a set of attitudinal statements, ranging from "strongly agree" to "strongly disagree" along with an additional "don't know" option. These statements are dealt with more comprehensively in Chapter 6. Respondents were then asked about their openness to land mobility and the reasons certain types of land mobility appealed to them. Questions were also asked relating to the amounts of land respondents would hypothetically lease in or out and prices they would pay to lease in or out land. Respondents were also given information relating to land leasing and asked whether the information added to their knowledge of long-term leasing. Finally, respondents were asked some financial questions such as the value of

their entitlements, their farm income, the percentage of farm income in relation to total household income and the amount of debt their farm had.

SAMPLING AND SURVEY COLLECTION

The survey was conducted by the survey company Amarach. Information was collected from a nationally representative sample of 846 farmers, conducted in two waves: between November 2014 and February 2015 and between October 2015 and March 2016. In order to achieve a representative geographical spread, a starting point was randomly selected in each county with every third farmer being selected to participate in the study. The survey continued in each county until a quota of respondents in each county was reached. Quota sampling set demographic quotas on the sample based on known population distribution figures (Howley & Dillon, 2012). The quotas used here were based on known population distribution figures in relation to specific farm systems (dairy, cattle rearing, cattle other, sheep, tillage and mixed) taken from Central Statistics Office data (CSO, 2012). A breakdown of respondents is shown in Table A.1.

Table A.1 Sampled Farms

<i>Size</i>	<i><10</i>	<i>10_20</i>	<i>20-50</i>	<i>50-100</i>	<i>>100</i>	<i>Total</i>
Dairy	2	9	133	22	21	187
Cattle Rearing	3	35	71	8	3	120
Cattle Other	17	65	139	17	9	247
Sheep	10	28	73	11	6	128
Tillage	5	22	49	5	13	94
Mixed	0	4	24	10	4	42
Other	15	4	9	0	0	28
Total	52	167	498	73	56	846

SUMMARY

This appendix details the stages of development of the DCE survey used in this research. The process of survey design began with a review of the relevant literature and input from agricultural experts. Focus groups were also formed in order to identify the attributes used in the DCE and inform the survey as a whole. The survey was then pre-tested to ensure its cohesion and understandability and pilot-tested in order to test the survey and DCE in the field. Finally, the sampling procedure was determined and execution of the survey was conducted by the Amarach survey company.

APPENDIX B. - QUESTIONNAIRE

amárach research
S14-310
TEAGASC LAND MOBILITY SURVEY

November 2014

/ / / /

Version 1 (1a Q40)

USE Showcard set 1
RENT IN

SECTION A: FARM AND FARMER CHARACTERISTICS

ASK ALL

Q.1 What is the total number of **hectares or acres** farmed by you in 2014? **SINGLE CODE**

Less than 10 ha (25 acres)	1
10-< 20 ha (25-< 50 acres)	2
20-< 50 ha (50-< 123 acres)	3
50-< 75 ha (123-< 185 acres)	4
50-< 100 ha (185-< 247 acres)	5
100-< 150 ha (247-< 370 acres)	6
150+ ha (370 + acres)	7

Q.1a **INTERVIEWER TO CODE:** Was the answer at Q.1 in **hectares or acres**? **SINGLE CODE**

Hectares	1
Acres	2

ASK ALL

Q.1b Indicated the approximate number of **hectares of tillage** on your farm?

Ha	Or	Ac
----	----	----

ASK ALL

Q.2 And which of the following **most closely** reflects your major farm activity? **SINGLE CODE**

Mainly dairying	1
Mainly cattle rearing	2
Mainly cattle other	3
Mainly sheep	4
Mainly tillage	5
Mainly mixed livestock	6
Other (Please specify: _____)	7

ASK ALL

Q.3 Please estimate the total number of animals on your farm in 2014.
And what is the number of animals in each of the following enterprises?
(Interviewer instruction: If doesn't apply type in '0')

	NUMBER
Dairy	
Beef Breeding Cattle	
Beef cattle (0-1 years)	
Beef cattle (1-2 years)	
Beef cattle (2+ years)	
Sheep	
Other (Please specify 1: _____)	

Other (Please specify 2: _____)	
Other (Please specify 3: _____)	

ASK ALL

Q.5 Which of the following terms best describes the **soil type** of most of your land? **SINGLE CODE**

Suitable for a wide range of agricultural uses (no limitations)	1
Somewhat limited by either poor drainage or altitude	2
Very limited for agriculture e.g. mountain areas	3

ASK ALL

Q.6 Record gender?

Male	1
Female	2

ASK ALL

Q.7 Which of the following age bands do you fall into?

Under 35	1
35 – 44	2
45 – 50	3
51 – 64	4
65+	5

ASK ALL

Q.8 What is your marital status?

Single (never married) not in a relationship	1
Single (never married) in a relationship	2
Married	3
Separated	4
Divorced	5
Widowed	6

ASK ALL

Q.9 Do you have any children?

Yes	1
No	2

ASK ALL

Q.10 Which of the following **best describes** the level of education you have obtained? **SINGLE CODE**

Primary	1
Some Secondary	2
Leaving Cert	3
Professional qualification at diploma level	4
College/University Degree/Postgraduate Degree	5
Currently studying	6

ASK ALL

Q.11 Which of the following describes the **HIGHEST** level of formal agricultural education you have obtained? **SINGLE CODE**

None	1
Teagasc Short Course	2
Agricultural College	3
Teagasc Cert/Green Cert	4
University Degree (B Agr Sc)	5
Other third level qualification	6

ASK ALL

Q.12 Please indicate the statement that most closely describes your farming over the **last** five years?

SINGLE CODE

Have made no significant changes	1
Increased production	2
Decreased production	3
Ceased some production	4
Don't know	5

ASK ALL

Q.13 Please tell me the statement that most closely describes your **Plans** for farming over the **next** five years? **SINGLE CODE**

Continue farming with no significant changes	1
Continue farming but with increased diversification	2
Increased intensity of production	3
Decrease intensity of production	4

SECTION B: CHOICE EXPERIMENT

We will now present you with some choice cards, describing a number of alternative land access options.

INTERVIEWER INSTRUCTION: USE SHOWCARD SET 1 RENT IN – SHOWCARD 1

Please give the example choice card to the respondent and talk through the choices with the respondent and say:

“Here is an example of a choice set you will be facing in this questionnaire”

Please give the respondent the example choice card and allow him/her time to examine it. Suppose there were three options regarding future land access options. In this show card each of the options are described.

READ OUT EACH STATEMENT IN TURN AND CIRCLE SCALE RESPONSE

	Option A	Option B	Option C ("Status quo option")
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance From Existing Field	1km	5km	
Land Quality	Poor – Land very limited for agriculture e.g mountain areas	Medium – Land somewhat limited by poor draining or altitude	
Price	€200 (€81 per acre)	€300 (€121 per acre)	

INTERVIEWER INSTRUCTION: READ OUT:

Let's go through the choice set as an example.

In the first Column, "Option A" is an option to rent in one hectare of land on a "conacre" (11 month) basis where the land is very limited for agricultural use and is 1 kilometre away from a field you already own. The cost to you of renting this one hectare of land for 11 months is €200. In the second Column, "Option B" is an option to lease in one hectare of land on a lease (at least 5 years) where the land is somewhat limited for agriculture, for example by poor drainage or altitude, and is 5 kilometres away from a field you already own. The cost to you of renting this one hectare of land per year for the length of the lease is €300.

You can also choose an "Option C" which means you would choose neither Option A nor Option B in this scenario. You would prefer to maintain your current land situation. Option C is the same in each choice card.

INTERVIEWER INSTRUCTION: READ OUT:

When making your choice please consider what you think the hectare of land is worth to you for the period of time you would be renting it. For this reason, when answering the series of choice sets below, please consider how much each hectare of land is worth to you and imagine you are actually paying the amounts specified. Which of the three options would you prefer?

You will now be presented with a series of similar choice sets and I would like you to identify the option you **most** prefer for each choice set. Remember to consider each choice set separately. Be aware that you are choosing whether or not to rent in **1 hectare** of land in each choice set.

There are no wrong or right answers. We are just interested in your opinion.

INTERVIEWERS INSTRUCTION:

Make sure the respondent understands the choice tasks before proceeding. Show respondent the choice cards one by one and ask her/him to choose one of the options provided.

Please note the choice cards must be shown one by one and the respondent is not allowed to look back on previous choice cards.

Make sure to register choice on each choice card before proceeding.

Choice card 1

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	Adjacent	1km	
Soil Quality	Poor – Land very limited for agriculture e.g mountain areas	Good – Land suitable for a wide range of agricultural uses (no limitations)	
Price	€400 (€162 per acre)	€300 (€121 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 2

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	1km	5km	
Soil Quality	Medium – Land somewhat limited by poor draining or altitude	Good – Land suitable for a wide range of agricultural uses (no limitations)	
Price	€400 (€162 per acre)	€500 (€202 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 3

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	Adjacent	5km	
Soil Quality	Good – Land suitable for a wide range of agricultural uses (no limitations)	Poor – Land very limited for agriculture e.g mountain areas	
Price	€300 (€121 per acre)	€300 (€121 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 4

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	5km	Adjacent	
Soil Quality	Poor – Land very limited for agriculture e.g mountain areas	Medium – Land somewhat limited by poor draining or altitude	
Price	€300 (€121 per acre)	€500 (€202 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 5

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	5km	Adjacent	
Soil Quality	Medium – Land somewhat limited by poor draining or altitude	Poor – Land very limited for agriculture e.g mountain areas	
Price	€500 (€202 per acre)	€100 (€40 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 6

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	5km	1km	
Soil Quality	Medium – Land somewhat limited by poor draining or altitude	Good – Land suitable for a wide range of agricultural uses (no limitations)	
Price	€200 (€81 per acre)	€400 (€162 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 7

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	5km	1km	
Soil Quality	Good – Land suitable for a wide range of agricultural uses (no limitations)	Medium – Land somewhat limited by poor draining or altitude	
Price	€200 (€81 per acre)	€200 (€81 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 8

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	1km	Adjacent	
Soil Quality	Poor – Land very limited for agriculture e.g mountain areas	Medium – Land somewhat limited by poor draining or altitude	
Price	€100 (€40 per acre)	€600 (€243 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 9

	Option A	Option B	Option C
Type of Land Access	Lease in	Conacre in	No change from current land holding position
Distance from Existing Field	1km	5km	
Soil Quality	Good – Land suitable for a wide range of agricultural uses (no limitations)	Medium – Land somewhat limited by poor draining or altitude	
Price	€600 (€243 per acre)	€200 (€81 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 10

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	Adjacent	1km	
Soil Quality	Good – Land suitable for a wide range of agricultural uses (no limitations)	Medium – Land somewhat limited by poor draining or altitude	
Price	€200 (€81 per acre)	€600 (€243 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 11

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	1km	Adjacent	
Soil Quality	Medium – Land somewhat limited by poor draining or altitude	Poor – Land very limited for agriculture e.g mountain areas	
Price	€400 (€162 per acre)	€300 (€121 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

Choice card 12

	Option A	Option B	Option C
Type of Land Access	Conacre in	Lease in	No change from current land holding position
Distance from Existing Field	Adjacent	5km	
Soil Quality	Poor – Land very limited for agriculture e.g mountain areas	Medium – Land somewhat limited by poor draining or altitude	
Price	€600 (€243 per acre)	€200 (€81 per acre)	
Which do you like best?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	

INTERVIEWER ENSURE ONLY ONE RESPONSE IS GIVEN FOR 'WHICH DO YOU LIKE BEST' ABOVE

SECTION C: REMAINDER OF QUESTIONNAIRE

ASK ALL

Q.14 Which of the following statements best describes your own plans for the future?

I expect that I will retire from farm work at some stage (you will provide neither managerial control nor labour to the farm)	1
I expect to become semi-retired at some stage (you will provide some managerial control and/or labour to the farm)	2
I expect that I will never retire from farm work (you will maintain full managerial control and provide some labour to the farm)	3

ASK IF CODE 1-2 @ Q14 (WILL RETIRE OR SEMI-RETIRE)

Q.15 At what age do you expect to retire or semi-retire?

55 – 65	1
65 – 75	2
75+	3

ASK ALL

Q.16 What is your desired succession and inheritance outcome? **SINGLE CODE**

Hand the farm over to a sole successor (keep farm as one unit)	1
Divide particular elements of the farm (land, house etc.) amongst the family	2
Sell the farm to divide assets equally	3
Other (Please specify: _____)	4
Don't know	5

ASK ALL

Q.17 Have you identified a successor that will work on the farm when you retire?

Yes	1
No	2

ASK ALL

Q.18 What is the relationship of potential successor/s? If more than 1 potential successor please rank them where 1 is the 1st potential successor, 2 is 2nd potential successor etc. **(Interviewer Instruction: First circle potential successor/s at Q18a and if more than 1 circled, rank them all at Q18b).**

	18a CIRCLE	18b RANK
Son	1	
Daughter	2	
Niece/Nephew	3	
Grandchild	4	
Brother/sister	5	
No relation	6	

ASK AL

Q.19 Have you made a succession plan?

Yes	1
No	2

ASK ALL

Q.20 Have you a will in place?

Yes	1
No	2

ASK ALL

Q.21 On average how many hours a week do you spend working on the farm?

Less than 20 hours a week	1
21 – 40 hours a week	2
41 – 60 hours a week	3
More than 60 hours a week	4

ASK ALLQ.22 How many regular full and part time farm workers, including yourself and family members are employed on your farm? **(Interviewer: If not applicable type in '0', confirm the total number)**

	Q.22a Number of Non-family	Q.22b Number of Family
Full time		
Part time		
TOTAL		

ASK ALL

Q.23 Do you yourself have an off-farm job or income?

Yes	1
No	2

ASK ALLQ.24 Do you get professional help with your farm business from one or more of the following?
MULTI CODE

Agricultural Consultant	1
Teagasc	2
Tax adviser	3
None of these (DNRO) (SINGLE CODE)	4

ASK ALL

Q.25 Are you a member of a Farmer Discussion Group?

Yes	1
No	2

ASK ALL

Q.28 On a scale of 1 to 4 where 1 is strongly disagree and 4 is strongly agree, how strongly you agree or disagree with each of the following statements? **(Interviewer Instruction: single code for each statement). SHOWCARD 2**

	Strongly Disagree	Disagree	Agree	Strongly agree	Don't know
1. Agricultural land in Ireland is under-utilised	1	2	3	4	9
2. I enjoy farming much more than I would other potential sources of employment	1	2	3	4	9
3. I am good at finding different types of information to help me run my business	1	2	3	4	9
4. My economic future on this present farm is bright	1	2	3	4	9
5. To be successful in farming it is important for me to adapt and use new technologies (whether agri or non-agri technologies)	1	2	3	4	9
6. I have to keep my farm running to ensure I have something to pass on to my children/next generation	1	2	3	4	9
7. I am cautious about adopting new ideas and farm practices	1	2	3	4	9
8. It is important for me to be respected by other farmers	1	2	3	4	9
9. It makes more sense for me to join an agricultural scheme if my neighbours are also joining	1	2	3	4	9
10. Farming is a more rewarding job in terms of quality of life, independence and lifestyle than it is in terms of money	1	2	3	4	9
11. Leasing out my land would be preferable to selling my land	1	2	3	4	9
12. It is important for me to pass on my land in as good a shape or better than I received it	1	2	3	4	9
13. It is important to visit other farms to look at their methods	1	2	3	4	9
14. It is important not to be afraid of adopting new farming practices	1	2	3	4	9
15. It is important not to leave farm land idle	1	2	3	4	9
16. It is important to own the land I farm	1	2	3	4	9
17. Conacre restricts what I can do with the land	1	2	3	4	9
18. Long term leasing (> 10 years) In would be preferable to Conacre	1	2	3	4	9
19. I don't think it is a good idea to take too many risks when it comes to farming	1	2	3	4	9
20. Farming Partnership is an option I would consider	1	2	3	4	9
21. Long term leasing (> 10 years) Out would be preferable to Conacre	1	2	3	4	9
22. Conacre should have a right of renewal every year	1	2	3	4	9
23. Short term leasing (5-10 years) Out would be preferable to Conacre	1	2	3	4	9
24. Conacre leads to less land mobility	1	2	3	4	9
25. Short term leasing (5-10 years) In would be preferable to Conacre	1	2	3	4	9

LAND MOBILITY ACTIONS

ASK ALL

Q.29 Would you **Sell** land under any circumstances?

Yes	1
No	2

ASK IF CODE 1 @ Q29

Q.30 If yes, under what circumstances? If more than 1 circumstance please rank them where 1 is the 1st most important, 2 is 2nd most important etc. **(Interviewer Instruction: First, circle mentioned circumstances at Q30a and if more than 1 circled, rank them all at Q30b).**

	Q30a CIRCLE	Q30b RANK
No successor	1	
For retirement/pension plan	2	
Financial reasons	3	
To purchase land closer by	4	
To purchase better quality land	5	
To consolidate holding	6	
Other (Please specify: _____)	7	

ASK ALL

Q.31 Are you aware of leasing?

Yes	1
No	2

ASK ALL

Q.32 Are there benefits to leasing?

Yes	1
No	2
Don't know	3

ASK ALL

Q.33 Who benefits most from leasing?

Lessor – farmer leasing out	1
Lessee – farmer leasing in	2
Benefit equality	3
Don't know	4

ASK ALL

Q.34 Would you lease **in** land under any circumstances?

Yes	1
No	2

ASK IF CODE 1 @ Q34

Q.35 If yes, under what circumstances? If more than 1 circumstance please rank them where 1 is the 1st most important, 2 is 2nd most important etc. **(Interviewer Instruction: First, circle mentioned circumstances at Q35a and if more than 1 circled, rank them all at Q35b).**

	Q35a CIRCLE	Q35b RANK
To expand Farm	1	
To provide for family	2	
To increase holding for successor	3	
To obtain better quality land	4	
To consolidate holding	5	
To increase productivity	6	
Other (Please specify: _____)	7	

ASK ALL

Q.36 Would you lease **out** land under any circumstances?

Yes	1
No	2

ASK IF CODE 1 @ Q36

Q.37 If yes, under what circumstances? If more than 1 circumstance please rank them where 1 is the 1st most important, 2 is 2nd most important etc. **(Interviewer Instruction: First, circle mentioned circumstances at Q37a and if more than 1 circled, rank them all at Q37b).**

	Q37a CIRCLE	Q37b RANK
No successor	1	
For retirement/pension plan	2	
Financial reasons	3	
To provide for family	4	
Other (Please specify: _____)	5	

ASK ALL

Q.38 Would you **Buy** land under any circumstances?

Yes	1
No	2

ASK IF CODE 1 @ Q38

Q.39 If yes, under what circumstances? If more than 1 answer please rank them where 1 is the 1st most important, 2 is 2nd most important etc. **(Interviewer Instruction: First, circle mentioned circumstances at Q39a and if more than 1 circled, rank them all at Q39b).**

	Q39a CIRCLE	Q39b RANK
To expand Farm	1	
To provide for family	2	
To increase holding for successor	3	
To obtain better quality land	4	
To consolidate holding	5	
Financial reasons	6	
Other (Please specify: _____)	7	

INTERVIEWER INSTRUCTION:

READ OUT INFORMATION ABOUT LEASING FROM THE NEXT PAGE AND THEN PRESENT IT TO THE RESPONDENT.

AFTER RESPONDENT READ IT AND EXAMINE THAT PAGE PLEASE TAKE THE QUESTIONNAIRE BACK AND CONTINUE INTERVIEWING WITH Q40.

INTERVIEWER PLEASE READ OUT AND LET THE RESPONDENT READ AND HAVE A LOOK AT IT HIM/HER SELF AS WELL

Leasing is where land is leased out by a lessor to a lessee for a minimum of 5 years. In order to incentivise leasing, the land owner is exempt from income tax on lease rental income.

The tax exemption limits are as follows:

5 to 7 year lease	=	up to €18,000 rental income per year;
7 to 10 year lease	=	up to €22,500 rental income per year;
10 to 15 year lease	=	up to €30,000 rental income per year,
15+ year lease	=	up to €40,000 rental income per year.

The rental income can include income from both land and entitlements. Tax reliefs do not apply to leases to son/daughter but can lease to niece/nephew and claim reliefs. Universal social charge still applies on rental income.

ALK ALL

Q.40 Did the information provided add in any way to your previous understanding of leasing?

Yes	1
No	2

ASK ALL

Q.41a Rank from 1 to 5 from the following options from **Lessor perspective** (the person that is leasing the land out) where 1 is most important to Lessor and 6 is least important.

(Interviewer Instruction: Rank Q41a. Read out all options and make sure all 6 are ranked).

	Q41a Lessor
More Land Security	
Tax benefits	
Forward planning	
Incentive to Improve land	
Formal arrangement (contract)	
Source of Income	

ASK ALL

Q.41b Rank from 1 to 5 from the following options from **Lessee perspective** (the person that is leasing the land in) where 1 is most important to Lessee and 5 is least important.

(Interviewer Instruction: Rank Q41b. Read out all options and make sure all 5 are ranked).

	Q41b Lessee
More Land Security	
Forward planning	
Incentive to Improve land	
Formal arrangement (contract)	
More income potential	

ASK ALL

Q.42 If you were given the option of Leasing **IN** land, how much land would you potentially lease **in**?

SINGLE CODE

Land Area (ha)	Lessee IN
1 to < 5	1
5 to <10	2
10 to < 15	3
15 to < 20	4
20 to < 30	5
30 +	6

ASK ALL

Q.42a What is the most you would be willing to pay to **lease in** a hectare/acre of land? **(Round to the nearest €)**

€

ASK ALL

Q.42b Please confirm if that price <€ from Q.42a> is per Hectare or per Acre? **SINGLE CODE**

Hectare	1
Acre	2

ASK ALL

Q.44 If you were given the option of leasing **OUT** land, how much land would you potentially lease **out**?

Land Area (ha)	Lessee OUT
1 to < 5	1
5 to <10	2
10 to < 15	3
15 to < 20	4
20 to < 30	5
30 +	6

ASK ALL

Q.44a What is the minimum you would be willing to receive pay to **lease out** a hectare/acre of land?
(Round to the nearest €)

€

ASK ALL

Q.44b Please confirm if that price <€ from Q.44a> is per Hectare or per Acre? **SINGLE CODE**

Hectare	1
Acre	2

ASK ALL

Q.45 Please tell me the importance of the following in making a decision to make your land available to others for agricultural use? **SINGLE CODE PER ROW**

	Not important	Less Important	Important	Very Important	Don't know
1. Market conditions/Price for Land	1	2	3	4	9
2. Market conditions for Agriculture	1	2	3	4	9
3. Current Agricultural policy conditions	1	2	3	4	9
4. Current Taxation policy/Incentives	1	2	3	4	9
5. Quality of land	1	2	3	4	9
6. Distance to/from Land	1	2	3	4	9
7. Location of Land	1	2	3	4	9

ASK ALL

Q.46 What effect will the Budget 2015 changes have on your likelihood to change your farm holding by adding additional land or making your land available to others for agricultural use?

SINGLE CODE PER ROW

	Less Likely	More Likely	No Change
1. Adding Additional Land	1	2	3
2. Making your land available to others	1	2	3

ASK ALL

Q.47 Looking at this card, please tell me an estimate of the value of your entitlements per hectare?

IF FARMER IS UNSURE, ASK FOR AN ESTIMATE. SHOWCARD 3

Less than €100 per hectare	1
€100 to €150 per hectare	2
€151 to €200 per hectare	3
€201 to €250 per hectare	4
€251 to €300 per hectare	5
€301 to €350 per hectare	6
€351 to €400 per hectare	7
€401+ per hectare	8
Not sure	9

ASK ALL

Q.48 Could you please tell me the letter that best describes your annual pre-tax **farm** income including subsidies (after deduction of all farm costs)? Please do not tell me the household income.

Please note that this information is confidential. SHOWCARD 4

A	Less than €0	1
B	€0 - €3,999 per annum	2
C	€4,000 - €9,999 per annum	3
D	€10,000 - €19,999 per annum	4
E	€20,000 - €29,999 per annum	5
F	€30,000 - €39,999 per annum	6
G	€40,000 - €49,999 per annum	7
H	€50,000 - €59,999 per annum	8
I	Over €60,000 per annum	9
	Don't know/ Refused	10

ASK ALL

Q.49 What percentage of your total household income comes from the farm business?

25% or less	1
26-50%	2
51-75%	3
76-100%	4

ASK ALL

Q.50 Which of the following would best describe the level of debt in your farm business?

None at all	1
Lightly in debt	2
Heavily in debt	3

ASK ALL

Q.51 And finally, what is your nearest Townland?

Write in:

ASK ALL

Q.52 What county do you live in?

Carlow	01	Kilkenny	10	Offaly	19
Cavan	02	Laois	11	Roscommon	20
Clare	03	Leitrim	12	Sligo	21
Cork	04	Limerick	13	Tipperary	22
Donegal	05	Longford	14	Waterford	23
Dublin	06	Louth	15	Westmeath	24
Galway	07	Mayo	16	Wexford	25
Kerry	08	Meath	17	Wicklow	26
Kildare	09	Monaghan	18		

That is the end of the interview, thank you very much for your time.

Interviewer Declaration: I confirm that this interview was conducted according to instructions and in compliance with the MRS code of contact

Signed: _____

Date: _____

INTERVIEWER INSTRUCTION:

Please record respondent details on the next page for validation purpose.

/ _ / _ / _ /

THANK YOU AND I JUST HAVE A FEW QUESTIONS FOR VALIDATION PURPOSES

Respondent Name	
Respondent phone number	
Respondent full address	

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